ELECTRICAL WORLD

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Utility Men Protest Federal Tax Shift

ALARMED by the prospect of enabling action in the Senate on the House bill already approved by Representatives (ELECTRICAL WORLD, April 29, page 533) spokesmen for the electric light and power industry this week appeared in Washington before the Senate finance committee to offer objections to the proposed shift of the federal energy tax of 3 per cent from the consumer to the utility companies.

Representing the Edison Electric Institute, William J. Hagenah told the committee that "unless the avalanche of taxes, federal, state and local, sweeping down upon utility companies is checked it will be impossible for these companies to continue their present services." He stated it was estimated that the federal tax has run as high as 30 per cent of the net income of some utilities. "It would be impossible," concluded Mr. Hagenah, "for the electrical industry to absorb the large tax burdens, because even if state commissions were disposed to allow their payment by increased rates, the competitive conditions in the business are such that the development of the service would be greatly retarded thereby."

Utilities as an exception

Under examination Mr. Hagenah maintained that an exception should be made in the case of the utilities, the only producers permitted under the existing law to pass the tax on to the users, because of the difficulties in obtaining any offsetting rate increases from the commissions of 48 separate states.

Randall J. LeBouei, Jr., general counsel for Niagara Hudson, testified that hardships would result from shifting the tax from where it constitutes no real burden and concentrating it upon relatively few companies.

W. C. Mullendore, vice-president Southern California Edison Company, declared that the tax could be paid by utilities only at the expense of property, service and future credit in many instances. Samuel Ferguson, president Hartford Electric Light Company, also testified.

Stockholders warned

John E. Zimmermann, president United Gas Improvement Company, told his stockholders at the annual meeting this week that had the tax been paid by that organization in 1932 "it would have cost the U.G.I. subsidiaries $1,000,000, or 4 or 5 cents a share."

A. R. Graustein, president International Paper & Power, told his shareholders that "if this legislation becomes law a precedent of extraordinary danger to the electric industry will have been established. Coming at a time when utility earnings have already suffered from the cumulative effects of the depression and from rate reductions this proposed 3 per cent tax would have a ruinous effect on many companies."

In a letter to public utility security owners, W. H. Onken, Jr., president American Security Owners' Association, points out that the measure would add more than $26,000,000 to the existing tax burden of the electric public utilities of the country.

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House Passes Seaway Pact; Action by Senate Pends

In spite of strong opposition the joint resolution ratifying the agreement made between the federal government and the New York Power Authority allocating the power to be developed in the international rapids section of the proposed Great Lakes-St. Lawrence waterway was passed last week by the House of Representatives without a roll-call. Under the provisions of the agreement New York State assumes $89,726,000 toward the total of $272,453,000 the United States is to contribute to the project. The resolution has been sent to the Senate, but no action has been taken by that body up to the present time.

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Up-State Energy in New York City

Interchange of electrical energy between New York City plants of the Consolidated Gas Company system and up-state generating stations of the Niagara Hudson Power Corporation (ELECTRICAL WORLD, April 22, page 505) began early this week when the gap in the 132-kv. transmission at Yonkers was closed. Little or no energy will be sent north until the summer season arrives.

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Senate Backs Norris Bill; Compromise Efforts Due

Flatly refusing to accept the House bill (ELECTRICAL WORLD, April 29, page 529) for the further development of Muscle Shoals and the Tennessee Valley, the Senate this week approved the Norris bill by a vote of 63 to 20. The House, equally obdurate, will, according to party leaders, reject the Norris bill. The two measures are scheduled for conferences at an early date so that difficulties may be ironed out.

Major differences between the two bills are those relating to fertilizers and the government distribution of power. Senator Norris, whose measure the Senate approved in virtually the form that it has been previously voted for seven times, made one concession to commercial fertilizer interests, including in his latest bill provisions for the leasing of nitrate plant No. 2.

Washington Supreme Court Upholds City Revenue Tax

Cities and towns of Washington are empowered with full authority to impose excise taxes to raise revenue so long as they do not abuse the privilege or enact measures conflicting with taxes levied by the state. So rules the state Supreme Court in connection with the Seattle ordinance imposing a 3 per cent occupational tax on the gross revenues of private utilities.

Appeals against the decision of a lower court were made by the Puget Sound Power & Light, Pacific Telephone & Telegraph and Seattle Gas companies, on the grounds that the city had no power to levy the tax, that the state had pre-empted this field of taxation and that the tax was unreasonable, oppressive and confiscatory.

The Supreme Court in its majority opinion ruled: Cities and towns have the right to tax in this way, state taxation does not conflict, and the question of whether or not the tax is confiscatory is primarily a legislative problem, so that the tax could not be held invalid unless clear abuse of power were demonstrated.

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Insull New England Units Go to Wyman; Plans Made for Eastern Group

CONTROL of the New England Public Service Company, formerly a unit of the Middle West Utilities System, has passed into the hands of a group of New England financiers headed by Walter S. Wyman, president of the company. It is assumed that the controlling interest was acquired from the Central Hanover Bank & Trust Company, which bought 52 per cent of the common stock of the New England company at auction late in December. The bank had held the stock as part of the collateral securing defaulted loans of $5,789,917 to the National Public Service Corporation. The New England stock—501,275 common shares—was bought by the bank for $1,800,000. Additional blocks of the New England Public Service stock are still held as they were when the National Public Service Corporation went into bankruptcy nearly eleven months ago. These blocks are 20.8 per cent pledged with the Manufacturers Trust Company to secure its loans to certain Insull companies, 17.7 per cent pledged under National Electric Power debentures and 1.2 per cent pledged with the Chase National Bank, the balance of 8.2 per cent being variously owned.

Referee approves Eastern plan

Plan for the creation of a new holding company to own control of the Penn Central Light & Power Company, the Michigan Electric Power Company, the Tide Water Power Company, the Georgia Power & Light Company and the Florida Power Corporation, five other Insull properties in the East, was approved last week by Irwin Kurtz, referee in bankruptcy for four holding companies formerly in the Middle West Utilities group. At the hearings opposition was provided by Utilities Power & Light Corporation, an unsecured creditor of the National Public Service Corporation, by representatives of the preferred-stock holders of that company and by preferred-stock holders of the Seaboard Public Service Company. Utilities Power & Light, to which is owed $4,215,000 under an unsecured note of National Public Service, launched the main drive against the plan. Representatives of that organization applied for an order removing the Irving Trust Company as trustee in bankruptcy for National Public Service before Federal Judge J. M. Woolsey, who denied the motion. Counsel for Utilities Power stated he would appeal the order.

As a result of the plan, all intercompany debts and claims and bank debts affecting the properties and companies included in the composition will be automatically eliminated. New York Trust Company will receive $3,600,000 and Chemical Bank & Trust Company $450,000 in notes of the new company, and New York Trust will hold voting trust certificates for 20,000 of the 100,000 common shares of the new company until the notes have been paid. The estate of the National Electric Power Company will receive 62,400 shares in the new company and the Seaboard Public Service estate 17,600 shares and will hold 78 per cent and 22 per cent respectively upon repayment of the notes. National Public Service estate will receive proceeds of the sale of certain assets if they exceed a certain amount and the Electric Management & Engineering Corporation will have some obligations eliminated.

Insull Son & Company in bankruptcy

Voluntary petition in bankruptcy has been filed against Insull, Son & Company, Inc., in the United States District Court in Chicago. Total liabilities are listed at $11,002,829, with book assets of $4,402,396.

Time for the filing of claims with the receivers of Middle West Utilities Company has been extended until July 1, from May 1, according to an order entered in the United States District Court by Federal Judge Walter C. Lindley.

In the meantime Justice Kingsbury of Toronto has granted Martin J. Insull the right to bring there the witnesses who gave depositions against him at Chicago. The justice made the comment, however, that he felt the depositions presented sufficient evidence on which to base an order for extradition of Mr. Insull to Chicago to face trial.

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Cities Service Stock Sales Explained to Commission

Continuing his testimony on the Cities Service Company before the Federal Trade Commission (ELECTRICAL WORLD, April 29, page 530), Thomas W. Mitchell, examiner-economist, told that body last week that Henry L. Doherty in March, 1929, realized a profit of $17,748,032 by the sale of 200,000 shares of Cities Service Company common stock, while almost simultaneously increasing his control in the company by 1,000,000 votes. Mr. Mitchell testified that the cost of the stock to Mr. Doherty was approximately $13.76 per share and that the sale was made at or near a time when the top price for the stock was $121.50 a share. The sale of the 200,000 shares reduced Mr. Doherty's voting power in Cities Service, Mr. Mitchell continued, but arrangements were made by which 1,000,000 shares of voting stock were sold at $1 per share to Henry L. Doherty & Company, which Mr. Doherty controlled. He thus obtained 1,000,000 votes in the management of the company.

Company attorney heard

Robert Burns, counsel for the Cities Service Company, in a statement regarding this voting stock, declared it was issued to combat efforts that outside interests were making to get control of the Cities Service organization. It was deemed advisable to continue the management as it had been, he said, and more than 80 per cent of the stockholders of the company, voting in person or by proxy on the question, were almost unanimously in favor of the plan to retain this management, which developed the company over a long period of years. Mr. Burns said the sale of 200,000 shares of stock by Mr. Doherty was not connected with the issue of 1,000,000 voting shares to the latter at about the same time. Mr. Doherty had been ill, he explained, and the sale was designed to place more cash in possession of his estate in case of his death, so that inheritance taxes might be met more easily.

He declared the sale was made to Cities Service Securities Company at a

price some $18 per share below the market, or $102.50 per share, and that through its resale on a rising market the stockholders of Cities Service Company received a gross profit of $11,000,000. The stock advanced after Mr. Doherty's sale to $270 a share, he added.

Mr. Burns defended the operations of the securities company in Cities Service stock, maintaining that its transactions were to assure ready markets.

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Tax Case Indictments Mention St. Louis Utility

Although not accused of any illegal act, Union Electric Light & Power Company has become the center of discussion in a tax assessment case in which indictments have been returned by a special grand jury in St. Clair County, Illinois. Five men were charged with conspiracy and a sixth with forgery before Circuit Judge Miller following confession by the former chairman of the St. Clair County Board of Review that he accepted money from various corporations for reducing their tax assessments. Union Electric was mentioned in five out of eight counts, one of which states that on July 7, 1932, the defendants "agreed to receive from the Union Electric Light & Power Company large amounts of money as a bribe to influence the decision of Addison J. Throop, Arthur O'Leary and Frank McKane, as members of the Board of Review, and Charles Melvin as a member of the Board of Assessors, and to influence them in fixing the assessment of land and improvements of the Union Electric Light & Power Company for purposes of taxation." Reference was made specifically to the Cahokia plant.

Cahokia property assessments have been changed considerably in the last few years. In 1928 the assessment against the plant was $3,800,000; in 1929 it was raised to $8,750,000, and in 1930 it was raised again to $10,450,000. In the course of 1931 the tax was reduced to $5,500,000 and the same figure was used in 1932. Meanwhile Union Electric had filed suit protesting against the assessment of 1929 and 1930 and the suit was finally compromised on a valuation of $7,500,000 for each of those years.

Louis H. Egan, president of Union Electric, has protested the idea that the company would stoop to such a practice as "ridiculous." "Never in the history of the company, so far as I know, has anything like this happened and in the seventeen years that I have been with it I know nothing such as is here suggested could have happened. We have paid no bribes of any kind . . . We appealed our assessment to the courts, regarding it as out of all reason, and the record of our protest is in the court files."

Frightened Into Activity

There is something tragic in the pitifully eager struggle of America to adjust itself to the desperate turn that the much-heralded new deal appears to have quite definitely taken. To plan expansion of trade and the financing of new business with the dollar a shadowy symbol of nothingness instead of the one sure reality in a world of illusion requires more than ordinary fortitude. Perhaps the courage of desperation itself, if the history of past inflations be observed. To face the national and international disgrace of needless repudiation of solemn agreements is a bitter pill for even those who so ecstatically welcomed the cure.

Trade indicators show improvement. Electrical energy production gains steadily and is now within 1.8 per cent of the previous year. Since residential use does not increase in the spring, a rise in industrial consumption for the actual production of goods must be assumed. Shipments of goods as reflected in carloadings show a halt in gains for the week, but in the aggregate display amazing gains for the past month. Automobile output and steel production are both rising. General indexes at high points for the year. Commodity prices are at nearly the levels of last year and have gained 7½ per cent in the month. Textile sales for April will probably show up the best for six months. Stock markets boil with the largest sales of the past seven months. Turnover 52,901,000 shares in April, against 20,088,000 in March. Average prices rose $16.78 in the month.

All of which means that with the dollar repudiated no one assumes it to be longer worth while to be thrifty, but to begin spending whatever there may be to spend and to acquire whatever tangible property one may be able to. This, one hears, is exactly what the administration wants. Not that it is intended to let the inflation get beyond control, but "just to get things started."

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Owen D. Young Remains With General Electric

Before the announcement of Owen D. Young's momentous General Electric-Radio Corporation of America decision, induced by the ruling of Attorney-General Cummings ("Electrical World," April 1, page 407), the Big Three of G.E. were photographed in conference. With Mr. Young are Charles Francis Adams, former Secretary of the Navy and newly appointed G.E. director, and Gerard Swope, president.

Coming Meetings

American Institute of Electrical Engineers—District meeting, Schenectady, N. Y., May 10-12. Summer convention, Chicago, Ill., June 26-30. H. H. Henline, 33 West 39th St., New York.

Electrochemical Society—Montreal, Que., May 11-13. Colin G. Fink, Columbia University, New York.

National Electrical Manufacturers Association—Hot Springs, Va., May 22-26. A. W. Berresford, 570 Lexington Ave., New York.

National Fire Protection Association—Milwaukee, Wis., May 29-June 1. A. R. Small, 109 Leonard St., New York.

Edison Electric Institute—Chicago, Ill., June 5-8. B. F. Weadock, 420 Lexington Ave., New York.

Canadian Electrical Association—Lucerne-in-Quebec, June 14-16. B. C. Fairchild, Power Building, Montreal, Que.

American Society of Mechanical Engineers—Chicago, Ill., June 26-30. C. W. Rice, 29 West 39th St., New York.

American Society for Testing Materials—Chicago, Ill., June 26-30. C. L. Warwick, 1315 Spruce St., Philadelphia, Pa.

Engineers' Day. Century of Progress Exposition—Chicago, Ill., June 28. G. E. Pfisterer, 308 West Washington St., Chicago.

Illuminating Engineering Society—Delavan, Wis., August 28-31. D. W. Atwater, 29 West 39th St., New York.

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Non-Metallic Paints Reduce Temperature Rise

Extended investigation of the relative value of aluminum and non-metallic paints in holding down temperature rise in power transformers has recently been completed by the electrical engineering department of the Boston Edison Company, with the conclusion that aluminum paint on the average can generally be expected to increase the temperature rise of the winding by about 7 per cent and decrease the full-load rating by about the same figure on the basis of continuous loading.

The effect of sunlight on the temperature difference between aluminum and gray non-metallic paint is small in winter, when the sun is low in the sky. The effect of changes in ambient temperature is far greater at average loads than the influence of the load cycle on the transformer oil temperature. Snow and rain were found to have more influence in reducing winding temperatures than high wind, and any factor which tends to increase convection and conduction tends to narrow the temperature spread between the two types of paint. The tests were made on two 3,500-kva., 13,800/4,150-volt transformers over a protracted period in which all sources of variation in conditions were reduced to practically negligible values.

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Oklahoma to Tax Energy

Included in the general sales tax bill passed in April by the Oklahoma Legislature were levies of 1 per cent on electricity and gas sold for industrial purposes and 2 per cent on electricity and gas sold for domestic purposes. The measure specifies that merchants are required to pay the tax on goods sold on credit at the time the goods are sold, rather than when collection is made, and that utilities cannot pass the tax directly on to the consumer without obtaining permission from the Corporation Commission of Oklahoma. Only a statewide referendum vote, threats of which are now being heard throughout Oklahoma, can prevent the bill from becoming effective in 90 days from date of passage.

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Oregon Supreme Court Puts State Power Bill to Vote

Oregon's so-called Grange power bill, passed at the recent session of the state Legislature and designed to launch the state into the utility business, may be referred to the people at the special election, July 21, according to a decision of the Oregon Supreme Court. The measure is being attacked by the Security Owners Association, Portland, Ore., which, on application to the Attorney-General for a ballot title for the referendum, was advised that the act carried the emergency clause and was consequently in effect and beyond the reach of referendum. Appeal to the Supreme Court reversed this decision on the ground that an act "regulating taxation and exemption" could not constitutionally be declared an emergency and so would not become a law until June 9, 90 days after the close of the legislative session. The association may, therefore, have the measure referred if it secures 16,667 signers to its petition prior to June 9.

The measure attacked authorizes the election of a state power commission, the use of unappropriated waters of the state to develop power, the acquiring and operation of hydroelectric plants, and issue bonds upon approval of the voters up to $65,000,000. On the grounds that this commission could acquire the property of existing electric utilities which pay approximately two million dollars in annual taxes, and thus remove this property from the tax roll, the Supreme Court ruled that in effect the measure did regulate taxation and exemption.

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Missouri Association Hears of Taxless-Town Illusion

For an average net bill covering 50 kw.-hr. of electrical energy consumers of municipal plant systems pay $5.24, but utility company customers pay $4.20, E. F. McKay, manager Oklahoma Utilities Association, told the convention of the Missouri Association of Public Utilities last week. Figures compiled by his organization are the basis for the indicated difference of $1.04 to users in towns served by privately owned companies.

"Claims in behalf of the success of municipal utility operation in general and particular claims that municipal utility plants either avoid or reduce the tax burden on cities they serve rest upon accounting practices that are indefinite, unethical, incompetent and often illegal," Mr. McKay said. "To study the facts involved in this highly controverted issue and to defeat the purpose of the man who would master the public today by continually whispering or shouting into the public ear the advantages of municipal utility ownership is the duty of every patriotic member of the utility industry."

An intimation of some of the electric appliances being developed for the future was the promise of the paper of E. W. Smith of the General Electric Company. R. R. Parks of the Missouri College of Agriculture covered the future in farm electrification.

New officers chosen

Fred Karr, St. Joseph Gas Company, was elected president to succeed A. E. Bettis, Kansas City Power & Light Company, who had been president the last two years. Among other officers elected were: First vice-president, D. W. Snyder, Jr., Missouri Power & Light Company; second vice-president, C. E. Michel, Union Electric Light & Power Company; third vice-president, C. F. Farley, Kansas City Power & Light Company.

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Utilities Protest New Tax as Confiscatory Measure

North Dakota power companies, subject to a 12 per cent gross receipts tax under a recent legislative act, are preparing to challenge the validity of the law, which they contend imposes the highest utility levy of any state in the union. The tax, collectible beginning next year on this year's receipts, affects companies furnishing electricity, artificial gas or steam.

Counsel for the companies claim the tax to be confiscatory and discriminatory in that their firms have been singled out of the various utilities to bear a higher tax. It is estimated that approximately $740,000 a year would be derived under the law. Power concerns in 1932 paid a tax of $480,000, based on assessed valuation of their property. This tax was 7.8 per cent of their gross operating receipts.

The act provides for apportioning 20 per cent of the tax to the state fund for common schools, 10 per cent to the counties and 70 per cent to the taxing districts in the county in proportion to the value of the companies' property in

those districts. An amendment eliminated telephone and telegraph companies from the measure.

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Utilities Power & Light Sued Over Subsidiary's Fees

Alleging that more than $5,000,000 had been diverted from the Laclede Gas Light Company to the Utilities Power & Light Corporation, suit has been filed in the St. Louis, Mo., Circuit Court against the holding company by L. M. Monheimer, merchandising manager of the Famous-Barr Dry Goods Company. Payment of fees to the Management & Engineering Corporation has also been attacked.

In commenting upon the suit E. P. Gosling, president of the Laclede Gas Light Company, has stated it to be the culmination of efforts by Mr. Monheimer to sell stock to the operating company. Mr. Monheimer, he said, had bought 400 shares at $265 per share, and about a year ago offered them to the company at $700 and later at $400.

"The company never sold any stock to the public and did not sell any stock to Mr. Monheimer," said President Gosling. "The company cannot take the public's money to buy the stock of a dissatisfied stockholder at many times its value."

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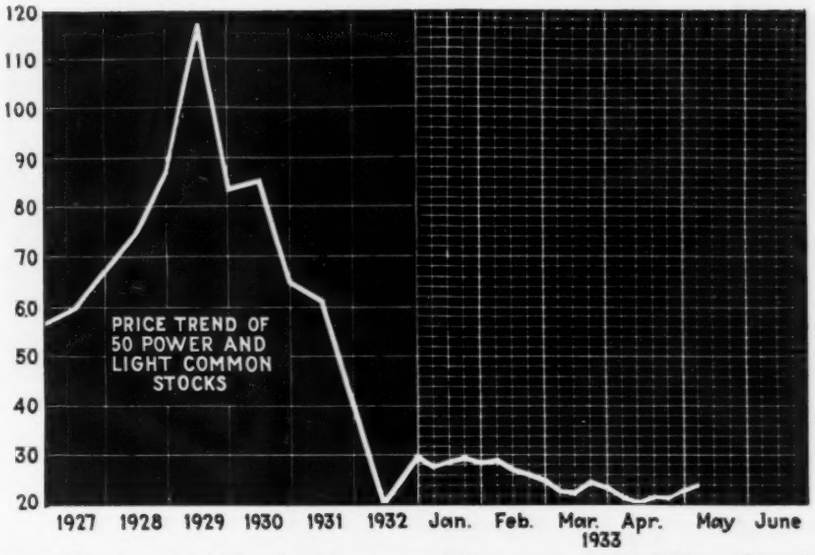
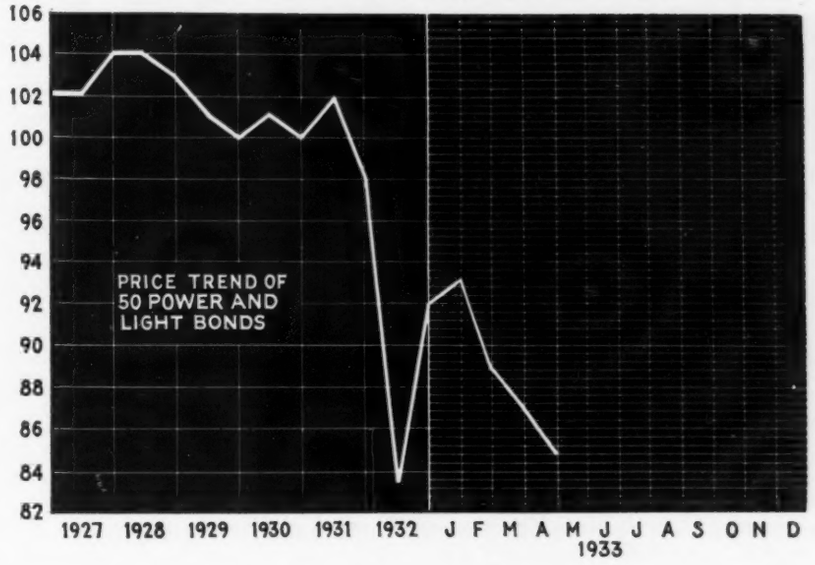
Single Utility Issue Features April Financing

Although the total of new financing during the month of April advanced above the record low for the preceding month, the number of new security offerings was meager. The feature of the month was the issue of short-term notes totaling $26,000,000 offered by the Edison Electric Illuminating Company of Boston (ELECTRICAL WORLD, April 22, page 501). This was the only utility issue.

Inflation Rules the Markets



Responding to speculative impulses, securities representing dollar values fell off, while those representing equity values rose. Inflation is the answer. "Electrical World" bond index at 84.6; stocks 24.1 this week, 22.6 last week.



Current Earnings Reports of Electric Light and Power Companies

Operating Companies

	1933	1932	Per Cent Increase	Operating Ratio 1933	Operating Ratio 1932
Detroit Edison (Year ended March 31)					
Gross earnings	$42,216,547	$48,090,458	—12.2	72	65
Net earnings	11,848,313	16,642,092	—28.8	..	..
Net balance	5,548,692	10,667,939	—48.2	..	..
Duquesne Light (Year ended January 31)					
Gross earnings	24,939,273	27,574,455	— 9.5	43	42
Net earnings	14,054,450	16,153,402	—13.0	..	..
Net balance	10,220,521	12,549,541	—18.5	..	..
Kansas City Power & Light (Year ended March 31					
Gross earnings	14,666,253	14,636,117	0.2	62	60
Net earnings	5,574,304	5,917,951	— 5.8	..	..
Net balance*	3,721,880	4,375,549	—14.9	..	..
Philadelphia Electric (Three months ended March 31)					
Grossearnings	16,193,663	17,590,924	— 8.0	50	52
Net earnings	8,020,215	8,490,943	— 5.5	..	..
Net balance	5,393,764	5,811,612	— 7.2	..	..
Southern California Edison† (Year ended March 31)					
Gross eanings	36,175,679	40,156,909	—10.0	32	32
Net earnings	24,685,987	27,164,739	— 9.0	..	..
Net balance*	17,477,859	20,263,799	—14.0	..	..

Holding Companies

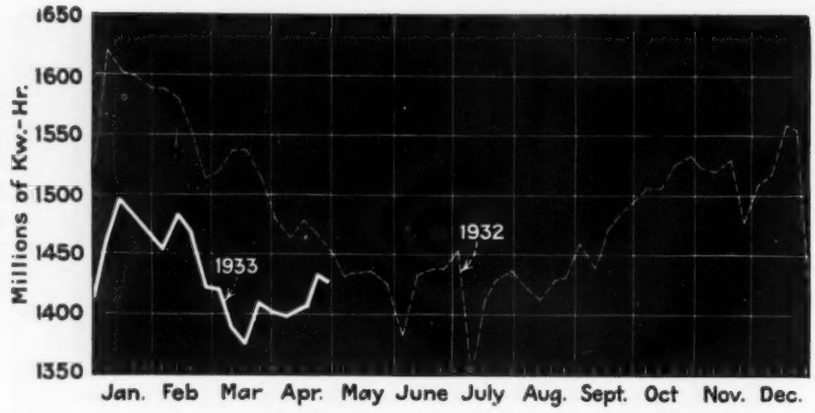
	1933	1932	Per Cent Increase	Operating Ratio 1933	Operating Ratio 1932
Commonwealth & Southern and Subsidiaries (Year ended March 31)					
Gross earnings	$110,384,715	$127,356,099	—13.3	54	53
Net balance	1,450,389	12,031,977	—87.9	..	..
North American and Subsidiaries (Year ended March 31)					
Gross earnings	110,234,739	123,767,292	—10.9	67	65
Net balance	12,144,629	21,343,107	—43.1	..	..
Public Service Corporation of New Jersey and subsidiaries (Year ended March 31)					
Gross earnings	121,700,777	136,378,225	—10.7	66	66
Net balance*	26,579,828	30,715,564	—13.4	..	..
United Gas Improvement and Subsidiaries (Year ended March 31)					
Gross earnings	111,476,783	120,049,197	— 7.1	56	57
Net balance	26,253,004	28,523,275	— 7.9	..	..

* Available for all dividends

† Operating expenses do not include depreciation.

Gross earnings—(Operating Companies) Gross operating revenue. (Holding Companies) Gross operating revenue plus other income. Net earnings — Earnings after deduction from gross earnings of operating expenses taken to include taxes, depreciation, maintenance, operating, etc. Net balance — Balance available from income for common stock dividends.

Approaching the Line



Still closer approach to operations in 1932 is indicated by the announcement of the Edison Electric Institute that the output of central stations during the week ended April 29 was only 1.8 per cent less than a year ago, production being estimated at 1,427,960,000 kw.-hr. The decrease from the preceding week shrank to 3,000,000 kw.-hr., against 15,000,000 at this time last year. In both of the past two weeks the output has exceeded that of any other since February 18.

The Atlantic Seaboard, and New England in particular, surpassed 1932 by wider margins than last week. The Pacific coast shows a strong advance. In the Central industrial area recent gains were virtually held.

Weekly Output, Millions of Kw.-Hr.

Week ended	1933	1932	1931	1930
April 29	1,428	1,455	1,644	1,698
April 22	1,431	1,470	1,676	1,725
April 15	1,410	1,481	1,641	1,733
April 8	1,399	1,465	1,647	1,715
April 1	1,402	1,480	1,680	1,708

Per Cent Change from Previous Year

Region	Week Ended Apr. 29	Apr. 22	Apr. 15
Atlantic Seaboard	+0.5	+0.1	— 4.9
New England alone	+2.5	+1.1	— 6.0
Centra lindustrial	—4.2	—3.6	— 6.
Pacific Coast	—1.3	—6.4	— 6.
United States	—1.8	—2.6	—4.7

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Saskatchewan Commission Reports on 1932 Operations

Plants of the Saskatchewan Power Commission generated 46,426,171 kw.-hr. of electrical energy during 1932 and the commission purchased 1,803,503 kw.-hr. from other sources, according to the annual report. The figures for the previous year were 46,040,000 kw.-hr. for generated current and 1,414,420 kw.-hr. for purchased current. The government-owned system operates fourteen generating plants and fixed assets are placed at $7,345,916. The commission's total revenue for the year is given at $1,162,023, an increase of $65,901, or 6 per cent over 1931. Operating profit for 1932 amounted to $132,217, and, after interest, depreciation and replacement reserves, a deficit of $50,979 for the year is shown.

The commission's generating plants have a total installed capacity of 27,385 kw. The new Saskatoon power plant, valued at $1,895,000, is the commission's largest single asset. The old Saskatoon plant, also owned by the commission, has a valuation of $976,000. The major plant at Saskatoon, with its new equipment, carried the whole load distributed from that point continuously throughout last year, the power generated and peak load being the same as that reported in 1931.

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Output Off 9 per Cent in March, says Survey

Combining the effect of the nationwide slackening of industrial activity during a large part of the month with the resumption of greater activity toward the end, electrical energy generated in public utility plants during March was 9 per cent less than it was a year ago. This percentage, announced by the U. S. Geological Survey, was quite accurately foreshadowed by the average of the weekly figures published by the Edison Electric Institute.

Of the 6,635,956,000 kw.-hr. generated, 2,989,665,000 kw.-hr., or 45 per cent, came from water power. These quantities include the output not only of central stations for light and power, but also of plants for electric railways and of railroads for electric traction, Bureau of Reclamation and public works plants and that part of the output of manufacturing plants which is sold.

The average daily production was 214,100,000 kw.-hr., or nearly 4½ per cent less than in February. The normal change, the Survey report states, is a decrease of about 2 per cent.

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Appeal Court Orders New Bagnell Trial

Long-continued litigation over the compensation to be allowed the Snyder Estate Company for land inundated by the Lake of the Ozarks when the Bagnell Dam of the Union Electric Light & Power Company was completed appears probable. Last week a jury verdict of $350,000 damages was upset when the United Circuit Court of Appeals in St. Louis reversed the existing decision and remanded the case to the district court for the western district of Missouri for a new trial.

The Snyder estate sought $1,000,000 damages for about 159 acres of land in Ha-Ha-Tonka Park. Condemnation commissioners awarded the estate $143,000. Both sides excepted to the findings of the condemnation commission. Costs are estimated to have been $150,000 for the first trial alone.

Reversal of the decision was based upon the contention that the judge at the first trial had erred in his charge to the jury and that evidence prejudicial to the defendant had been admitted.

▼

Geological Survey Reports 83,153,000,000 Kw.-Hr.

Final report on the production of electricity in the United States in 1932, as made by the Department of the Interior through the Geological Survey, shows a total of 83,153,000,000 kw.-hr. to have been produced for public use in 1932. Of this total, 41 per cent was produced by the use of water power and 59 per cent by the use of fuels. The proportion of the total output produced by the use of water power was more in 1932 than ever before.

The total output in 1932 was 9.4 per cent less than in 1931, which in turn was 4.4 per cent less than in 1930, and the output in 1930 was 1.5 per cent less than in 1929, the year of maximum output. The output by the use of water power in 1932 was 11.4 per cent greater than in 1931, and the output by the use of fuels was about 20 per cent less than in 1931. The total output in 1932 was about 14.5 per cent less than in 1929; the demand for electricity has therefore held up remarkably well.

▼

Austria Has 1,764-lb. Plant

Austria has an unusual generating station, Renate, Niederlausitz, in which steam is generated at 1,764 lb. per square inch and at a superheat of 887

deg. F. The boilers produce about 40 tons of steam an hour to operate two 8,500-12,000-kw. three-stage turbines and generators. A service record of 12,000 hours for the boilers without any trouble being experienced is reported.

▼

Refrigeration Leads, but Collections Slow

Further evidence that electric refrigeration promises to be an important commercial, energy and manufacturing factor in the electrical business of 1933 continues to develop. In a recent statement Dun & Bradstreet, Inc., point that "increases in production and sales in the electrical supply trade are confined currently almost exclusively to refrigeration divisions." "In many instances," states the report, "the latter are running from 100 to 200 per cent ahead of those of last year at this period, and some companies are maintaining working schedules of 24 hours a day. Shipments, at many plants, are being made at the rate of thirty carloads a day, and total sales for April are expected to run in excess of the March figures, which were the highest in the last five years for some of the leading manufacturers. Cash sales increased sharply during the month in Baltimore, while distributors in Buffalo, Newark, St. Louis, Philadelphia, Cleveland, Chicago, and Washington reported an unusual increase in store trade.

Fewer firms failed

While the collection ratio to outstandings on recent sales is satisfactory, the collection of old indebtedness is a slow and laborious process. Since the early part of April, installment accounts have been paid a little more promptly, and many overdue payments have been cleaned up.

Despite the increase in the number of failures among wholesalers and retailers of electrical supplies in 1932, the total insolvencies for the industry in that year dropped to 209 from 217 in 1931. The defaulted indebtedness also decreased, the $4,589,173 set down for 1932 contrasting with $4,822,234 in 1931. The largest decrease in the involved liabilities appeared in the manufacturing division.

▼

Hoover Dam Line Approved

The Board of Water and Power Commissioners of Los Angeles, Calif., has approved the contract between the Reconstruction Finance Corporation and the municipal Department of Water and Power granting a loan of $22,800,000 for construction of the power bureau's proposed 271-mile transmission line from Los Angeles to Hoover Dam. The contract will be submitted to the California Supreme Court for formal approval. The loan agreement provides that the money shall be used exclusively for paying the cost of construction of certain extensions and improvements of the municipal electric generating, transmission and distribution system, consisting of transmission lines and stations to be used primarily for the transmission of energy to be generated at Hoover Dam.

▼

Gerard Swope Testifies on 30-Hour Week Bill

Legislation to insure a six-hour day and a five-day week for industrial and business America has failed to receive definite action by Congress. At a hearing last week in Washington Gerard Swope, president of the General Electric Company, told the House labor committee that he emphatically favored the minimum proposal incorporated in the measure sponsored by Secretary Perkins and known as the Black bill.

Mr. Swope contended that the measure would make little difference in the matter of international competition, as there the handicap imposed on domestic manufacturers from countries with depreciated currencies greatly overbalanced working-hour factors. That the bill was "too rigid for practical application" and that it did not go far enough were among Mr. Swope's points. Instead of having a week of 30 hours Mr. Swope would arrange a 26-week working period, in which the maximum working hours would be 832, an average of 32 a week. In order to retain flexibility he would have a maximum in any one week of 48 hours and a maximum day of eight hours.

▼

Appliance-Sales-Made-Easy Boost Maine Revenue

After trial with rental-purchase plans for water heaters and free-wiring for ranges Central Maine Power Company has some notably satisfactory results to show. Last year the company's new rental purchase plan increased the use of electric water heaters on the system as a whole by 43 per cent, while free wiring of electric ranges in the last six months of 1932 increased range sales about 280 per cent over the first half of the year. In both plans dealers cooperated to mutual advantage and during the year the company withdrew from the wiring business.

Although merchandise sales decreased 42 per cent in 1932, chiefly on account of lower unit prices, the estimated increase in revenue from the use of household appliances exceeded $83,000. Central Maine also reports notable increase in its rural service business. During the past five years the average use on farms served by the company has risen from 372 to 499 kw.-hr., a 34 per cent increase.

Major New Construction This Week

Ohio Power Company, Newark, Ohio, has authorized construction of new transmission line from power plant at Philo, Ohio, to Mishawaka, Ind. Reported cost close to $600,000, with switching and substation facilities.

Motors, controls, hoists and conveyors will be installed in multi-story addition to plant of Enterprise Can Company, McKees Rocks, Pa. Cost about $120,000.

General electrical equipment for Acme Brewing Company, San Francisco, Calif. Estimated cost $125,000.

Culpeper, Va., has authorized fund of $120,000 for city-owned electric light and power plant.

Machine drives, motors and other general electrical equipment required for rebuilding of works of Berwind-White Coal Company, Windber, Pa. Cost $100,000.

General electrical equipment for Golden West Brewery Company, Oakland, Calif. Cost about $125,000.

Bids will be asked to close early in June for prime movers and auxiliary equipment for city-owned electric light and power plant at Rockford, Iowa. Appropriation of $105,000 authorized.

Heavy-duty motors, compressors, pumping machinery, etc., required for rebuilding refinery at Martinez, Calif., of Shell Oil Company. Cost about $125,000.

105,000 Kw. Generator for Battersea

England has succumbed to the competitive spirit which leads to the production of exceedingly large generating units. Contract has been made between the London Power Company and the Metropolitan-Vickers Electrical Company for a 105,000-kw. alternator for the Battersea station to cost approximately $1,250,000.

▼

New York Metal Prices

	April 25, 1933 Cents per Pound	May 2, 1933 Cents per Pound
Copper, electrolytic	6.25	6.50
Lead, Am. S. & R. price	3.50	3.50
Antimony	6.125	6.25
Nickel ingot	35.00	35.00
Zinc, spot	4.05	4.10
Tin, Straits	30.00	32.375
Aluminum, 99 per cent.	23.30	23.30

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California Franchise Renewed

Los Angeles, Calif., county Board of Supervisors has renewed for 50 years a franchise of the Southern California Edison Company, Ltd., covering all of the public utility facilities of the company in unincorporated county territory. Under terms of the franchise the company pays the county 2 per cent of its gross receipts for the use of roads and

streets. In extending the present franchise, which has several years of a 40-year term to run, the supervisors adopted an ordinance cancelling franchises of approximately twenty small companies absorbed in the past by the Edison company.

▼

Governor Jogs Michigan Board

Governor Comstock last week addressed the Michigan Public Utilities Commission, asking a report on the Detroit Edison rate case following a communication from the City Council calling attention to the fact that 90 days have elapsed since the board made its "five-day" audit.

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Crosley Refrigerator Output

Following the trend previously noted in refrigeration manufacture (ELECTRICAL WORLD, April 22, page 503) production increases continue. Crosley Radio Corporation has raised output schedules for electric refrigerators to around 400 units a day and is currently about ten days behind on orders. The division is on a 24-hour production schedule.

▼

Los Angeles Substation Opened

Embodying some of the most recent innovations in design and operation, as well as two of the largest power transformers on the Pacific Coast, a new $400,000 substation for the supply of the west and central portions of Hollywood, Calif., has just been placed in use by the Bureau of Power and Light, Los Angeles.

▼

South Carolina Offices Ordered

Following the act of the 1932 Legislature the South Carolina Railroad Commission has ordered two utility companies operating in that state, but with headquarters elsewhere, to open offices in South Carolina. Organizations involved are the Southern Public Utilities and Carolina Power & Light companies. The objective is the location of pertinent records within the state.

▼

Martinsville Refunds Made

Refund of approximately $60,000 to residents of Martinsville, Ind., has been made by the Northern Indiana Power Company. The sum is that collected during 49 months in excess of the rates ordered by the Indiana Public Service Commission in February of 1929. The predecessor company serving Martinsville, the Wabash Valley Electric Company, contested the order and the funds were held in bond until the state Supreme Court upheld the commission's decision.

With the Legislators

CALIFORNIA—Senate to take action on a bill to equalize taxes on public utility corporations. The measure would result in a return of approximately $12,000,000 additional per biennium from the taxes on public utility corporations. The bill already has been passed by the Assembly.

DELAWARE—Efforts to bring out a bill creating a state public utilities commission, without the sanction of the committee appointed to formulate such legislation, were defeated. Regulation of public utilities by this session of the Legislature appears remote.

DISTRICT OF COLUMBIA—Legislation is being prepared by Public Utilities Commission designed to limit the jurisdiction of local courts in cases of appeals from orders of the commission. Purpose of the measure, which is to be forwarded to Congress, is to strengthen the power of the commission in its regulations of rates and valuations of the local utility companies.

FLORIDA—A measure introduced in the General Assembly requiring a 2 per cent sales tax includes public utility corporations.

MISSOURI—Governor Park has signed the McCauley bill, which vests in him the sweeping authority to remove at will any and all officials of state appointed by the chief executive. Although the Governor took no action on the famous Buford utility measure which would abolish the state public utilities commission and recreate that body as the commerce commission, in his approval of the McCauley bill many see defeat for the Buford bill.

NEBRASKA—Bill authorizing the organization of self-liquidating public power and irrigation districts, passed by both houses of the Legislature (ELECTRICAL WORLD, April 29, page 536), has been signed by the Governor.

NEW YORK—Governor Lehman has approved the bill amending the civil rights law, by providing that it shall be unlawful for any public utility company to refuse to employ any person in any capacity on account of race, color or religion. The Pratt bill amending the tax law by providing that the minimum franchise tax to be paid by electric, gas, etc., companies shall be $25 per year has been approved by the Governor.

NORTH CAROLINA—Stating that the pending North Carolina revenue bill will grant the power companies a saving of $246,300 annually, Representative W. C. Ewing has introduced an amendment to the bill which would impose a kilowatt tax of one-half mill, yielding $750,000 annually.

SOUTH CAROLINA—A bill sponsored by 29 Senators has been presented in the Senate to authorize a proposed $30,000,000 to $50,000,000 project for the development of hydro-electricity and navigation on the Santes and Cooper Rivers in coastal South Carolina. A commission of seven, to be known as "the South Carolina Public Service Authority," would administer the project.

WEST VIRGINIA—Under the terms of an act introduced in the Legislature any municipality is authorized to establish, construct, acquire, extend, operate, maintain and improve electric light and power plant systems and defray the cost of such construction, by issuing bonds secured by and payable from the revenues of such systems.

▼

As to Rates ——

• Approval has been rendered by the New York Public Service Commission of the rates offered by the New York Power & Light Corporation to its customers in the Schenectady district. The rates, identical with those now effective in the Albany district, will, it is estimated, save consumers about $40,000 a year.

• Completion of hearings by the Utah Public Utilities Commission in the case of 37 towns in that state which protested the rates of the Telluride Power Company have been completed. No decision is expected for at least a month. Briefs and arguments are to be filed.

• Representatives of twenty Pennsylvania towns, meeting in Bethlehem last week, were told that preliminary examination of the records of the Pennsylvania Power & Light Company revealed that organization to have earned from $4,000,000 to $5,000,000 above a 7 per cent return on the property investment in 1931. The meeting was under the auspices of Mayor Pfeifle. Mark Wolfe of New York testified.

• At the first meeting in the state-wide rate hearing inaugurated by the Illinois Commerce Commission (ELECTRICAL WORLD, April 22, page 500) Chairman Lindheimer of the commission reoutlined his reasons for action and agreed with representatives of eighteen northern Illinois utilities upon dates for individual hearings. Concurrence was gained between utilities and commission that the cases be handled through conferences rather than through the more lengthy and expensive method of formal hearings.

• Frankly introducing the question of today's values into the pending procedures in New York City for the reduction of all utility rates, Corporation Counsel Hilly has stated that he would show the cost of reproduction of two large electric companies to have dropped between 25 and 40 per cent. Consolidated Gas Company, top organization of the New York group, last week

lowered its dividend, long established, from $1 a quarter to 85 cents.

• Acting upon the application of the Otter Tail Power Company for permission to reduce residential and commercial lighting rates for one year by an amount that would save consumers an estimated $110,000, the North Dakota Railroad Commission last week gave its approval. Negotiations had been under way for several months.

▼

Welding Best for Today, Society Members Hear

That electric welding, with its ready adaptability to changes in designs as well as ease of development for new ones, offers the best fabricating process for today's machinery construction and can help lead business out of the doldrums was the contention of speakers at the annual meeting of the American Welding Society last week. The assembly plan which enables a minimum expenditure for patterns, molds and design expense, while bringing the advantages previously mentioned, was conceded a broad advantage among the factors of industrial revival.

Aside from two definitely scheduled committee reports and three lectures there were no formal presentations at the annual meeting. The committee on the use of welded steel parts for machinery construction, of which G. D. Spackman is chairman, reported a steady expansion of this activity into the general machinery field, with consequent savings in the weight of assemblies and simplification of design. The committee pointed to the continued change in the characteristics of machinery design since the advent of welded assembly.

Old structures rehabilitated

President Frank P. McKibben lectured on the erection of steel buildings and the strengthening of steel bridges by welding. Many structures otherwise needfully relegated to the discard have been reinforced and strengthened by welding without rebuilding at notable savings in the past year. Answering the question that constituted his topic, "Must Industry Be a Pawn or Power?" Charles F. Abbott, executive director of the American Institute of Steel Construction, urged continuation of the progressive action and policy which has led to the development of America as a nation of buildings predominantly of steel construction and besought defeat of government intrusion into industry.

Welding's place in the hoped-for early revival of trade and industry was discussed by W. T. Chevalier of the McGraw-Hill Publishing Company, who foresaw the entire course of the heavy-equipment industries affected by the potentialities of this assembly method.

Officers elected for the coming year were: President, F. P. McKibben, consulting engineer; senior vice-president, J. J. Crowe, Air Reduction Sales Company.

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Naval Observatory Time Protected

Lincoln Electric Company

Less than 90 ft. from the delicately sensitive Naval Observatory clock, whose $30,000 installation must be protected from vibration by every reasonable means, these workmen have been erecting, silently and vibrationlessly, the all-steel, welded buildings to protect two new 15- and 40-in. telescopes. Reasons for selecting the welded way were three: First, expansion and contraction of the dome plates, if riveted, might permit the entrance of light and heat rays to an extent which would be harmful to the telescopes; second, unnecessary vibration caused by rivet hammers might damage the observatory clock, and third, welding provides a more rigid and more economical structure.

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Electric Welding Used to Fabricate Navy Tugs

Two seagoing tugs completely welded electrically without riveting have been completed at the Boston Navy Yard, maximum economy in the use of energy being attained on production by the use of two operators and 400-amp. motor-generator service. The energy consumption per pound of metal deposited was 4.64 kw.-hr., compared with 7.09 kw.-hr. with resistor control and one operator working.

At a meeting last week of the Boston section of the American Welding Society J. A. Potter of the navy yard stated that for the first tug the welding was a shop job, in which 10,215 linear feet of welds were made, 2,312 man-hours being required. The average linear feet of weld per eight-hour day per welder was 35.3 and 2,410 lb. of bare electrode was used. Fabrication of the second tug was an outdoor job and required 23,592 linear feet of welds. The average daily output for all sizes and types of welds was 31.5 ft. per day per welder and 6,500 lb. of navy grade "B" bare welding wire was used. The total deposit was 0.275 lb. per foot of weld.

One tug is now en route to Hawaii under its own power and passed through a severe storm off Cape Hatteras without trouble. It was stated that electric welding results in reduced weight of vessel as compared with riveting. This process is now being utilized to some extent in destroyer construction, although riveting is still used for the longer vessels in view of the severe strains imposed in rough waters.

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Sterilizers for Hospitals

Many hospitals are changing their sterilizers over from steam to electric heat, according to a survey recently made by the Wilmot Castle Company, Rochester, N. Y. Radical improvements in heaters and control devices offer the apparent reason why they find it more economical to use electrically heated sterilizers than steam. A full battery of operating room sterilizers may require up to 30 kw., it is stated. Steam at 40 to 60 lb. pressure is used in the sterilizing room.

EDITORIALS

L.W.W.MORROW
Editor

When the power company quits merchandising

WHEN a power company discontinues the merchandising of domestic appliances, without preparing an adequate system of distribution to carry on, it makes a serious mistake. It sets back the development of domestic load in that community for a period of years.

It is a very simple thing for a top executive sitting upstairs in the big office, or the banker behind the top executive, in a distant city, to decide that the policy will be changed. Orders can be given. Selling can be stopped. But when the power company steps hastily out of the marketplace, that does not mean that somebody else picks up the work.

Theoretically, the dealers take on the retailing of this merchandise. But actually they don't. They lack salesmen. They lack plans. They lack financial resources. They lack experience. And it requires a year or so to develop a system of dealer co-operation adequate to provide the selling and the service needed, if the growth of load is to continue.

Successful selling of electrical appliances to the home is a highly organized operation today. It embraces the training and supervision of outside salesmen, the preparation and use of advertising and display, the management of home demonstration and service, the co-ordination of campaigns, the planning of wiring and appliance installations, the development of trade policy and, above all, the financing of installment contracts. All this is not created automatically out of thin air, when a utility company announces that it has decided to withdraw from merchandising. For these functions that the utility has been exercising have naturally not been duplicated by any one else. It takes time to set up something new, and the power companies owe it to the public, to the manufacturers, to the dealers and to themselves to see that time is taken.

This can be accomplished in several ways. The experience in Ithaca, as told in this issue, is an example. But merchandising cannot be stopped by a mere executive order, without injustice and unnecessary sacrifice.

Shift idle meters or buy new ones?

ECONOMIC analysis often discloses paradoxical conclusions. Few would offhand subscribe to the idea that it costs more to remove idle meters from service than to buy and install new ones where new services are demanded. But this is exactly the result found by one of the large companies after a painstaking analysis of several alternatives and several possible eventualities of future needs. Had the result of the study been applied in practice during 1932-33 and were it extended through 1934 it would save over the three years only 0.4 per cent of the total cost of operation, maintenance and fixed charges on the capital items. But for the final year it would show a saving of more than 13 per cent on the annual cost. During the three years it would also show a capital entry less by 3 per cent because of the way in which the uniform system accounting works in detail on the removal and reinstallation of meters.

Admittedly these savings may not be spectacular enough to overthrow the prevailing executive edict "nothing for capital and as near nothing as possible for operation." They are large enough, however, to provoke some thinking on the justification for an arbitrary decision. Presumably the

money will have to be spent in some form, in some degree and entered in some way in the books. If it can be so spent as to reduce annual charges and at the same time result in decreased capital entries it would seem that the decision not to buy but to look upon inactive services as a storeroom could well be reversed. Those inactive services represent homes that will be working for the company again before long. In view of the experience that resets run to three times the magnitude of inactive meters at any specific time it would appear the part of wisdom to save the expense involved in this triple turnover by taking the lesser cost of placing new meters and letting repairs and retest of existing idle meters run their normal periodic interval.

Decentralizing lighting sales

IN ORDER to increase the opportunity for individual effort, stimulate personal initiative and increase the efficiency of departmental sales activities the plan of organizing lighting business solicitation on a district basis has lately been given attention. One company serving 650 square miles of area divided its territory into five sections, assigning a sales engineer to each area and making him responsible for all lighting business in the section.

The procedure was found to have several advantages, such as concentration of territorial effort, simplification of campaigns, easier stimulation of contacts with contractors, district salesmen and local trade groups, a reduction in seasonal variations in active leads, easier placement of personnel and cuts in time, travel and expense for sales effort. General supervision was readily maintained from headquarters, and the cumulative effect of long-continued sales activities in particular neighborhoods was enhanced.

It is interesting to note that in the latest reported year $236,161 of increased lighting business was obtained from 142 man-months of sales effort, or $1,660 per man-month, compared with $268,193 added revenue from 207 man-months, or $1,290 per man-month in the year before decentralization. This may not be adaptable to relatively small properties, but it at least hints the value of systematic and intensive customer contacts in building lighting loads.

Flashover of insulators

IN THE flashover of solid insulators there has always been some question as to the part which is played by the nature of the surface of the insulator and its condition as regards moisture and other atmospheric deposits. While it has been clearly evident that if surface impurities are sufficient to elevate the conductivity substantially it must of necessity lead to flashover, nevertheless the question as to the importance of these conditions, when still relatively small in magnitude, has remained unanswered. An interesting series of experiments on this question by L. Inge and A. Walther is described in the June 17 number of *Archiv für Elektrotechnik*.

The results indicate clearly that the flashover is a failure of the air in the neighborhood of the surface and obeys the laws of spark breakdown in air. For a clean surface the flashover voltage approaches the value pertaining to the electrodes with dielectric removed. The influence of the condition of the surface takes place through the value of the potential gradient caused by current flow. When voltage is applied and current flows the surface of the dielectric takes up a charge which results, under continuous potential, in an excess of charges at the electrodes, particularly at the anode. This results in unequal potential distribution and excess voltage gradient near the electrodes. A time element enters here and for impulse voltages the flashover is approximately independent of the condition of the surface and corresponds to that of the air.

Results of this character explain more completely the improved performance of modern high-voltage line insulators. Enlarged metallic surfaces and arcing rings on the line ends of the insulator string, with corresponding increases in values of capacitance, probably have their principal value in a more uniform distribution of voltage over the entire string. The studies referred to above show, however, that this method of construction also causes lower values of stress in the air as related to surface conditions of the insulator units. It is evident, therefore, that a redistribution of potential over the insulator string by means of capacitance does not complete the problem, but beyond this, variations in surface conditions have a bearing on flashover and demand that account be taken of them in good insulator design.

Major Utility Systems Report Energy Data

144 light and power systems in the United States in the 100,000,000 kw.-hr. class—generated 71,636,-000,000 kw.-hr. in 1932—17 in Canada. 23 in the billion-kw.-hr. group here—5 in Canada.

HOW has the reduction of industrial operations during the past few years affected the output of electrical energy by individual companies? The answer for any one of the entire group of 100,000,000-kw.-hr. systems, accounting for 92 per cent of the energy generated during 1932 by all public utility light and power plants in the country, may be found by comparing the Supplement accompanying this issue with its precursors of other years.

The companies listed are almost identical with those reported a year ago. Some regrouping of smaller properties has added two to the list, bringing the total for the United States to 144. Six have been retained on the basis of past performance, although their output did not come up to the designated amount in 1932. In addition the tabulation covers 17 Canadian systems, one Mexican and 14 electric railways or electrically operated railroads.

As summarized in the insert* at the bottom of Table II* the light and power companies in the United States operated 1,884 plants, almost equally divided as to water-power and fuel-burning, the former with an aggregate rating of 8,773,051 kw., the latter with 21,905,581 kw. The average rating for the fuel-burning plants is 22,600 kw., of the water-power plants 9,600 kw. In their total of 30,678,632 kw. they constitute 90 per cent of the industry's entire rating.

Their output was 71,636,499,323 kw.-hr., 92 per cent of the total for the industry. Thus it appears that they are somewhat more heavily loaded than those of the companies not large enough for inclusion in the present list.

To the generated output there must be added 15,276,-782,129 kw.-hr. of purchased energy, making a total of 86,913,281,450 kw.-hr. to be accounted for.

The 144 systems serve 78.4 per cent of all electric light and power customers directly (Table VI) and a large additional number indirectly through smaller companies that purchase part of the 15,690,000,000 kw.-hr. sold to other public utilities.

First in evidence, in a comparison with 1931, is the flat 10 per cent decline in energy generated. Steam plants are fewer by 37, but their rating is larger by about 504,000 kw. Water-power plants added 262,570 kw., but the net increase in their number was only two.

For both classes combined the increase exceeded three-fourths of a million kw. Thus the installing of new equipment continues. The rate of increase is only a third of what it has been in some former years, but it is by no means negligible. Peak demands still have to be met; the pick-up of industrial loads cannot be indefinitely delayed; new plants effect economies over those they supersede; construction costs are low and advantage is being taken of that condition.

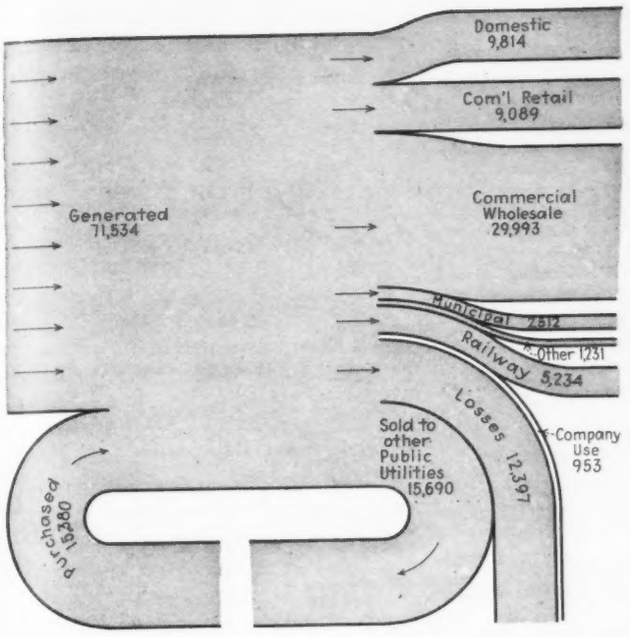
Intercompany movements of energy have not tended to decrease in proportion to the decrease in production.

*Supplement.

Table III—Allocation of Output of Major Light and Power Systems in 1932, 1931, 1930 and 1929

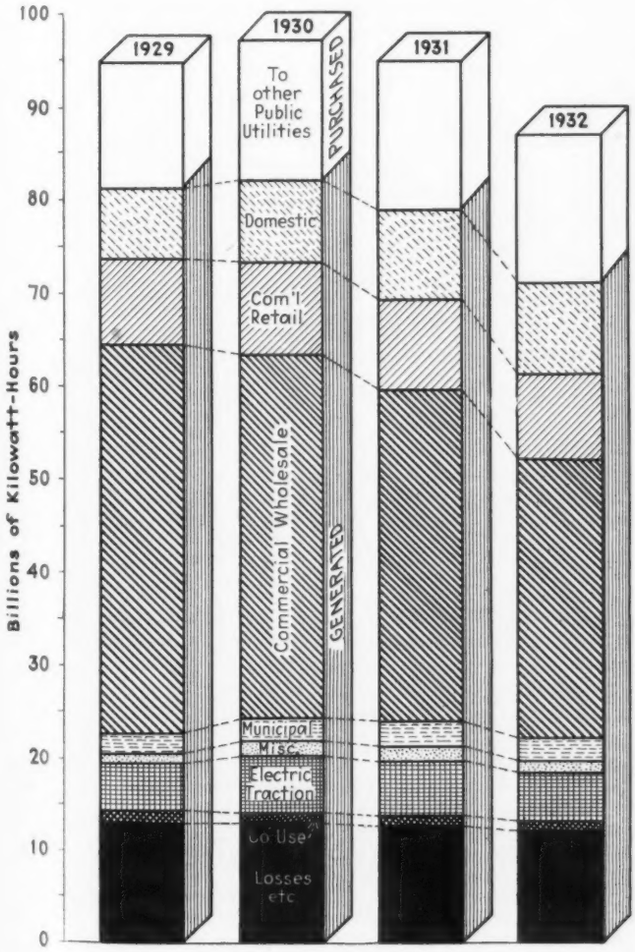
Class of Service	144 Systems in 1932			142 Systems in 1931			142 Systems in 1930			137 Systems in 1929		
	Millions of Kw.-Hr.	Per Cent of Total	Per Cent of Sales	Millions of Kw.-Hr.	Per Cent of Total	Per Cent of Sales	Millions of Kw.-Hr.	Per Cent of Total	Per Cent of Sales	Millions of Kw.-Hr.	Per Cent of Total	Per Cent of Sales
Domestic	9,814	11.3	17.0	9,694	10.2	14.9	8,860	9.1	13.1	7,561	8.0	11.3
Commercial retail	9,089	10.4	15.7	9,603	10.1	14.8	9,836	10.1	14.5	9,184	9.7	13.7
Commercial wholesale	29,993	34.6	51.8	35,633	37.6	54.9	38,934	40.2	57.3	41,752	44.1	62.5
Municipal	2,512	2.9	4.3	2,576	2.7	4.0	2,501	2.6	3.7	2,230	2.4	3.3
Other sales	1,231	1.4	2.1	1,715	1.8	2.6	1,572	1.6	2.3	971	1.0	1.5
Railway operation	5,234	6.0	9.1	5,698	6.0	8.8	6,209	6.4	9.1	5,149	5.4	7.7
Used by ultimate consumers	57,873	66.6	100.0	64,919	68.4	100.0	67,912	70.0	100.0	66,847	70.6	100.0
Other public utilities	15,690	18.0	.....	15,960	16.9	.....	14,945	15.4	.....	13,290	14.0	.....
Used by companies	953	1.1	.....	1,044	1.1	.....	1,019	1.0	.....	1,395	1.5	.....
Losses, etc.	12,397	14.3	.....	12,906	13.6	.....	13,225	13.6	.....	13,199	13.9	.....
Total	86,913	100.0	.....	94,829	100.0	.....	97,101	100.0	.....	94,731	100.0	.....
Company use plus losses in per cent of generated	.....	18.7	.....	.....	17.5	.....	.....	17.3	.....	.....	17.9	.....

*In each year the allocation in a few of the returns was incomplete and estimates had to be used.



Consolidated energy flow of 144 systems in 1932

Note—Late revision changes "Generated" to 71,636, "Purchased" to 71,277.



Four years' comparison of output

Decrease mainly in industrial use while domestic increased

On the contrary, there has been a gradual increase, whether viewed as a purchase (Table IV) or as a sale (Table III), barely more than checked even in 1932.

As a matter of fact, it makes little difference which of the two we select, for there has been an almost perfect equality, during the four years here tabulated, between purchases and intercompany sales in the aggregate. This equality appears only in the nation-wide balance sheet; it does not in general exist as to the individual companies. Such slight inequality as there is can be readily explained by purchases of energy from outside sources and by the transactions with the remaining eight or ten per cent of the industry.

23 in billion kilowatt-hour group

The billion-kilowatt-hour group in the United States comprises 23 systems with a combined output, generated and purchased, of 47,998,000,000 kw.-hr. Their generated output alone was 41,192,000,000 kw.-hr., 57.4 per cent of the total here tabulated and 52.8 per cent of the total of all electric light and power plants in the United States.

Last year the percentages were higher but this is primarily because the billion group included four more systems.

The New York Edison system again leads in generated output, with 4,957,300,000 kw.-hr., but in total it is exceeded by the Niagara-Hudson with 5,378,434,187 kw.-hr., 15 per cent of it purchased. Next, in close succession, come the Ontario Hydro system, the Pacific Gas and Electric, the Commonwealth Edison and the Shawinigan, all ranging from 3,170,000,000 to a little over 4,000,000,000 kw.-hr. Of the Canadian group five are in the billion-kilowatt-hour class.

In Table I* the utility systems are listed in order of total output, generated plus purchased; Table II* gives their plant capacity, allocation of output among the various classes of customers and the number of customers in each class.

Decline is in wholesale power

Since the electric systems here under consideration constitute so predominant a part of the whole industry it is to be expected that the trends and proportions will be very similar. So it appears from Table III that sales to ultimate consumers declined almost 11 per cent from their 1931 equivalent. Against 1930 the decrease was 13 per cent.

The changes were not at all evenly distributed among the various classes of customers. Sales for domestic use have been larger, each year. Retail commercial sales, largely for store and office lighting, declined only 5 per cent from 1931 and less than 8 per cent from the maximum, attained in 1930. Comparisons for these three years are valid because there was very little change in the operations covered.

It is in the commercial wholesale item that we come upon the real decrease, 16 per cent from 1931, 23 per cent from 1930, 28 per cent from 1929, although for that year an appreciably smaller fraction of the industry was represented (Table IV). These sales at wholesale are essentially a measure of the energy used in manufacturing. Their decrease marks the retardation of manufacturing activity throughout the land and—for those who care to make comparisons with similarly

**Supplement.*

detailed data for other years—in the service areas of specific companies.

These shifts have changed the proportions in the allocation of energy. Four years ago 62.5 per cent of all that went to ultimate consumers was in sales at wholesale; last year it was only 51.8 per cent.

Domestic use has greatly risen in relative importance —from 11.3 to 17.0 per cent during the same period—while the proportion of retail commercial sales has not greatly varied. However, in 1929 these latter outweighed the domestic; now the positions are reversed. Energy for railway operation again decreased. This item includes company-operated lines, also electrically operated railroads.

Changes from year to year of "other sales" to ultimate consumers are to be ascribed mainly to changes in classification by reporting companies. Some included here energy for domestic and commercial heating, others counted this in with corresponding lighting. Some separated out rural or agricultural energy use and customers, others did not. Classifications did not seem in all cases to be identical from year to year. In a few instances the reported allocation of energy was incomplete, as will be seen in Table II and in working out the national totals certain minor adjustments had to be made.

Domestic average rising

During these recent years of decreasing consumption of almost every kind of commodity, and of diminished use of nearly all kinds of service, comment has often been made on the contrasting condition with reference to the use of electrical energy in the home (Table V).

For the 144 systems this has now risen to 618 kw.-hr. per customer, from 605 kw.-hr. the year before. The only concession to present economic conditions seems to be that whereas the rate of increase has been as great as 50 kw.-hr. a year, this time it is only 13. The consumption increased in all regions ex-

Table IV—Comparison with Entire Light and Power Industry

	1932	1931	1930	1929
Major systems				
(a) Number	144	142	142	137
Energy, million kw.-hr.				
(b) Generated	71,636	79,491	82,194	81,561
(c) Purchased	15,277	15,338	14,907	13,170
(d) Sum, (b) + (c)	86,913	94,829	97,101	94,731
Total Industry in U. S.				
Energy, million kw.-hr.				
(e) Generated	*77,868*	*86,663*	*89,952*	*91,421*
Ratio (b) / (e), per cent	92	92	91	89
Aggregate kw.				
(f) Major systems	30,678,632	29,912,275	28,907,755	25,911,781
(g) U. S. total	*34,010,137*	*33,483,821*	*31,976,138*	*29,558,637*
Ratio (f) / (g), per cent	90	90	90	88

Table V—Average Energy per Residential Customer, Major Systems

Geographical Region	Kilowatt-Hours 1932	1931	1930	1929
United States	**618**	**605**	**551**	**492**
New England	532	510	467	415
Middle Atlantic	537	538	483	441
East North Central	626	610	580	526
West North Central	621	590	545	501
South Atlantic	710	661	589	520
East South Central	616	592	530	440
West South Central	542	508	470	415
Mountain	706	702	692	556
Pacific	862	861	793	635

Table VI—Number of Customers of Reporting Companies

	1932	1931	1930	1929
Domestic	15,859,513	16,021,506	16,053,261	15,363,715
Commercial retail	2,811,321	2,837,248	2,702,519	2,713,658
Commercial wholesale	361,646	399,551	318,595	460,628
Sum	19,032,480	19,258,305	19,074,375	18,538,001
Per cent of U. S. total	78.4	78.0	77.6	76.7

Table VII—Changes in Regional Plant Factors 1927-1932

Generated Kw.-Hr. ÷ (Plant Kw. × 8,760)
Expressed in per Cent

Region	1927	1928	1929	1930	1931	1932
New England	27.2	29.2	30.1	26.3	26.0	22.4
Middle Atlantic	33.7	35.0	37.3	34.7	32.3	29.4
E. North Central	35.7	35.3	35.1	31.5	29.6	26.1
W. North Central	31.1	32.8	34.1	32.7	28.6	25.9
South Atlantic	28.5	28.1	30.9	27.0	24.6	22.4
E. South Central	31.2	27.1	27.6	26.1*	26.3	22.5
W. South Central	38.5	35.2	41.9	38.6	33.2	28.6
Mountain	44.6	49.6	48.6	45.5	34.1	24.9
Pacific	40.6	39.2	41.1	37.8	35.5	31.0
United States	**34.1**	**34.3**	**35.9**	**32.7**	**30.3**	**26.6**
Canada	**57.2**	**55.2**	**61.7**	**51.1**	**44.4**	**42.7**

*Excluding 239,700 kw. available by lease or contract.

Table VIII—Comparison of Generated and Purchased Energy by Geographical Regions

In per Cent of Total (= Generated + Purchased) Output

Region	1927 Gen.	1927 Pur.	1928 Gen.	1928 Pur.	1929 Gen.	1929 Pur.	1930 Gen.	1930 Pur.	1931 Gen.	1931 Pur.	1932 Gen.	1932 Pur.
New England	84.6	15.4	81.3	18.7	83.7	16.3	81.4	18.6	78.4	21.6	73.1	26.9
Middle Atlantic	87.0	13.0	86.3	13.7	89.1	10.9	89.5	10.5	89.0	11.0	87.3	12.7
E. North Central	89.2	10.8	86.6	13.4	82.9	17.1	79.3	20.7	77.4	22.6	77.1	22.9
W. North Central	98.0	2.0	98.1	1.9	98.6	1.4	98.0	2.0	98.0	2.0	98.1	1.9
South Atlantic	87.8	12.2	86.6	13.4	83.8	16.2	83.3	16.7	79.6	20.4	76.9	23.1
E. South Central	76.4	23.6	79.7	20.3	73.2	26.8	72.8	27.2	70.5	29.5	75.2	24.8
W. South Central	86.1	13.9	85.7	14.3	83.7	16.3	84.0	16.0	83.6	16.4	82.8	17.2
Mountain	93.4	6.6	89.0	11.0	89.7	10.3	88.1	11.9	88.3	11.7	86.9	13.1
Pacific	86.2	13.8	86.3	13.7	87.3	12.7	84.6	15.4	87.8	12.2	84.4	15.6
United States	**87.5**	**12.5**	**86.5**	**13.5**	**86.1**	**13.9**	**84.7**	**15.3**	**83.8**	**16.2**	**82.3**	**17.7**
Canada	**82.7**	**17.3**	**86.6**	**13.4**	**88.9**	**11.1**	**87.4**	**12.6**	**84.6**	**15.4**	**81.7**	**18.3**

Table IX—Six-Year Analysis of Company Use and Losses by Geographical Regions

Energy Consumed for Companies' Own Use, and Energy Lost or Unaccounted for, in per Cent of Energy Generated in the Plants of Reporting Companies

Region	Intracompany Use 1927	1928	1929	1930	1931	1932	Lost and Unaccounted For 1927	1928	1929	1930	1931	1932	Combined Company Use and Losses 1927	1928	1929	1930	1931	1932
New England	1.50	2.71	1.56	1.28	2.05	2.10	16.60	16.90	15.20	15.35	15.82	17.42	18.10	19.61	16.76	16.63	17.87	19.52
Middle Atlantic	2.31	2.24	1.44	1.26	0.96	0.84	13.45	13.90	13.70	13.85	14.00	14.88	15.76	16.14	15.14	14.11	14.96	15.72
E. North Central	2.57	2.62	2.11	1.48	1.41	1.39	12.94	12.65	13.70	13.03	13.99	14.85	15.51	15.27	15.81	14.51	15.40	16.24
W. North Central	1.64	1.29	1.27	0.81	0.62	0.94	15.34	14.60	13.70	13.20	13.49	15.17	16.98	15.89	14.97	14.01	14.11	16.11
South Atlantic	2.39	2.12	2.23	2.06	2.16	1.90	12.70	13.00	17.02	17.90	19.10	19.55	15.09	15.12	19.25	19.96	21.26	21.45
E. South Central	8.18	3.73	4.28	1.15	1.01	1.09	18.00	18.70	18.40	19.30	18.30	20.40	26.18	22.43	22.68	20.45	19.31	21.49
W. South Central	3.58	5.14	3.23	2.08	1.78	2.17	17.30	15.28	13.75	15.40	16.43	17.65	20.88	20.42	16.98	17.48	18.21	19.82
Mountain	2.60	1.86	1.99	2.80	2.38	1.41	11.03	8.73	15.67	16.00	17.30	20.77	13.63	10.59	17.60	18.80	19.68	22.18
Pacific	1.62	1.53	2.10	1.24	1.59	1.51	20.72	24.05	23.12	23.10	22.46	24.28	22.32	25.58	25.22	24.34	24.05	25.79
United States	**2.59**	**2.38**	**1.97**	**1.44**	**1.32**	**1.33**	**14.85**	**15.20**	**15.52**	**15.78**	**16.24**	**17.34**	**17.44**	**17.58**	**17.50**	**17.22**	**17.56**	**18.67**

cept the Middle Atlantic and the Pacific, where it remained virtually unchanged from 1931. The most striking progress has been made in the South Atlantic region, which now ranks second only to the Pacific.

In connection with the national average for the present group of companies, 618 kw.-hr. per customer, reference may be made to the 601 kw.-hr. for all such service in the United States, including that rendered by small private and municipal establishments.

Reports from Canadian companies are too far from complete to warrant the computing of a corresponding average for that country.

Energy for intracompany use, plus losses in transmission and distribution, have changed very little for the country as a whole in the five-year period under consideration (Table IX). About 17.5 per cent of the energy generated fails for one reason or another to reach the ultimate consumer. In 1932 this rose to 18.7 per cent. The losses are in general smaller in the more densely populated parts of the country.

In a few instances negative values were reported under "Sales to Other Public Utilities." It is assumed that these represent the net result of pooling with neighboring systems in which energy received exceeded energy contributed.

How the reduced output affected the plant factors is brought out in Table VII. In each geographical region the average hourly station load is compared with the aggregate station rating.

With a few exceptions the utilization of plant rose to a maximum in 1929. Then the loads dropped off, although for various reasons new capacity was added from time to time. The result was a decrease in plant factor for the entire group of reporting companies from 35.9 per cent to 32.7, then to 30.3 and now to 26.6 per cent. In Canada, with its more favorable conditions created by 24-hour loads in the huge paper-and-pulp, lumber and electrochemical plants, the factor climbed to 61.7 in 1929; this decreased to 42.7 per cent in 1932.

To avoid an excess of notes on the supplement tables certain simplifications were necessary. Free energy and franchise requirements, also energy used by other departments, when indicated with energy for company use, was included as reported. Energy for company railway departments was included under electric railway operations. "Locations served" and "accounts billed" count as customers. "Industrial" was generally counted as large light and power; "commercial," when the average per customer was small, as small light and power; light for county, state and federal buildings with municipal lighting.

Group statistics are given in a few instances for properties which, though distinct corporate entities, are so interconnected and operated as to constitute in each case a single physical system. This is in accord with previous practice. The operating company remains the unit on which the tabulation is based.

In Table I of the supplement the figures for earlier years are taken from previous issues of the supplement for the same companies or for the predecessors of present companies when the sequence was evident; because of corporate changes they do not necessarily represent operations in identical areas, and the statistics are therefore not always directly comparable.

The tabulation was made possible only through the full co-operation of the companies represented. The data are published exactly as received, with the exception of the few adjustments previously mentioned.

For detailed data and summaries for earlier years reference should be made to the issues of ELECTRICAL WORLD for May 7, 1932; May 2, 1931; May 3, 1930; May 18, 1929; May 5, 1928, and April 20, 1927, with corresponding supplements.

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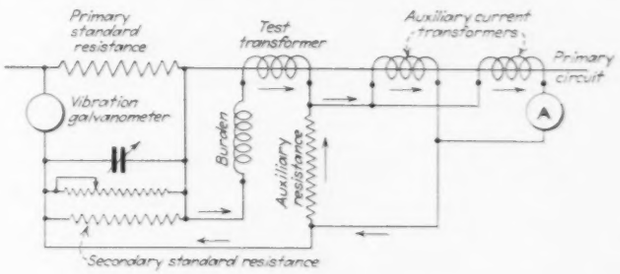
Reducing Current Transformer Burdens in Calibration

By G. W. STUBBINGS
South Norwood, England

Absolute methods of testing current transformers depend upon a comparison of the voltage drops in standard resistances connected in the primary and secondary circuits of the transformer, the ohmic values of these resistances being in the inverse ratio of the nominal currents they carry. The disadvantage of these absolute methods is that the burden of the transformer is not completely under control, since this burden necessarily includes the standard resistance used for the test. To measure the errors of a current transformer with an inductive burden of low impedance, the usual absolute methods are not very suitable, as the presence of the standard resistance in the secondary circuit renders it impossible to adjust the total burden to the required value.

If two additional current transformers are available, whose nominal ratio is the same as that of the transformer under test, the effect of the burden imposed by the standard resistance can be eliminated in the manner shown in the accompanying diagram of connections.



Auxiliary transformers and resistor neutralize testing burden

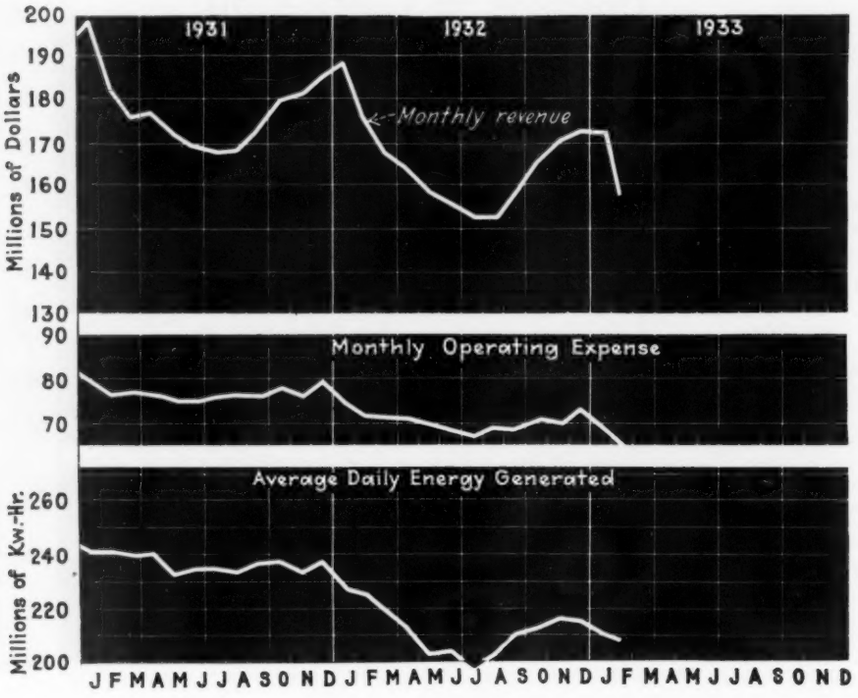
The secondary circuit of the test transformer includes the standard resistance, R, a second resistance, R_1, of exactly the same ohmic value as R, and the burden B with which the errors of the transformer are desired to be known. The primary windings of the two auxiliary current transformers are connected in series with that of the test transformer, while the secondary windings of the auxiliary transformers are connected in parallel, and connected to R_1 in such a manner that the total secondary current from these transformers passes through it in the opposite direction to the current from the test transformer. The resultant current in R_1 is equal to that in R, but its direction is reversed. The voltage drops in R and R_1 now cancel, and the sole burden on the current transformer is that imposed by the impedance B.
Great accuracy is not necessary for either the auxiliary transformers or for the second resistance R_1, since errors in these components of the circuit will have a negligible effect on the over-all precision of the test. The auxiliary transformers can, if desired, be used to operate an ammeter, or any other instruments required in connection with the test.

February Revenue Off 9.4 per Cent

Revenue of electric light and power companies in February regularly shows a decrease from that of January. The month has 10 per cent fewer days and the lengthening daylight hours bring about a gradual reduction in the lighting load. In addition the comparison with the corresponding month of the preceding year is this time affected by the introduction of the extra day in 1932, thereby making the month 3 per cent shorter in 1933.

These were probably the major influences that brought about a decrease in revenue of 7.6 per cent from January to $158,620,000 and a widening of the disparity compared with last year to 9.4 per cent, against 8.8 per cent in January. The result has been to bring the revenue below that of any February since 1927, though it remains higher than it was in that or any preceding year. Operating and maintenance expenses decreased in nearly the same ratio, to $64,460,000.

Energy output declined to 5,859,697,000 kw.-hr., 10.7 per cent less than in 1932 but only 1 per cent less, when expressed as average daily output, than in January. Of this amount water power contributed 42.5 per cent, which again is an unusually large portion of the total, though in actual kilowatt-hours it was 11.2 per cent less than a year ago. The resultant diminution in the demand on fuel-burning plants no doubt accounts in part of the lessened operating expenses.


1931
1932
1933
Millions of Dollars
Monthly revenue
Monthly Operating Expense
Average Daily Energy Generated
Millions of Kw.-Hr.
J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D

Regionally the percentages of revenue decrease from 1932 are closer to the national average than they have been in other recent months. The most favorable relative showing was made by the South Atlantic states, off 7.0 per cent, and New England, off 7.9 per cent. Except in the Mountain states, however, where the stagnation of the metal-mining industry has for a long time been reflected in severe curtailment in the sale of energy, the departures from the corresponding figures of the preceding year are greater than they were in the autumn and early winter.

The region reporting the smallest decrease in energy production was the Pacific, down only 5.5 per cent, with a slightly larger output from water power than a year ago. Less than 9 per cent of its total came from fuel. The largest decreases occurred in the South Atlantic and New England states, in each case after a much smaller change in January.

Table I—Energy Output of Central Stations in the United States

Compared with Corresponding Month of Previous Year

Month 1932	Generated, Thousands of Kw.-Hr.*						Purchased for Resale	
	Total		Hydro		Fuel			
	Generated	Per Cent Inc.	Generated	Per Cent Inc.	Generated	Per Cent Inc.	Thous. Kw.-Hr.	Per Cent Inc.
November	6,504,370	— 6.8	2,674,830	+37.2	3,829,540	—23.8	1,885,000	+ 3.5
December	6,662,849	— 9.4	2,578,552	— 0.2	4,084,297	—15.0	1,982,000	+ 3.5
1933								
January	6,535,454	— 7.8	2,826,699	— 3.8	3,708,755	—10.5	1,820,000	— 3.0
February	5,859,697	—10.7	2,489,727	—11.2	3,369,970	—10.1	1,534,000	— 8.5

Table II—Regional Revenue, Energy Output, in February, 1933

Compared with Corresponding Month of Previous Year

Region	Revenue		Energy Generated, Thousands of Kw.-Hr.*					
			Total		Hydro		Fuel	
	Thousands of Dollars	Per Cent Inc.	Generated	Per Cent Inc.†	Generated	Per Cent Inc.†	Generated	Per Cent Inc.†
United States	158,620	— 9.4	5,859,697	—10.7	2,489,727	—11.2	3,369,970	—10.1
New England	17,230	— 7.9	385,024	—14.6	215,175	—16.2	169,849	—12.7
Middle Atlantic	42,985	— 9.1	1,498,281	— 9.7	461,902	—17.2	1,036,379	— 7.8
East North Central	36,900	—11.3	1,353,806	—11.2	140,700	—29.5	1,213,106	— 8.3
West North Central	13,170	— 9.3	413,884	—10.8	125,261	—24.8	288,623	— 3.0
South Atlantic	17,337	— 7.0	759,197	—10.0	511,262	— 6.6	247,926	—16.2
East South Central	5,284	—10.0	237,665	—16.7	202,332	—16.1	35,333	—20.7
West South Central	8,460	—10.7	290,042	—13.0	22,038	—25.8	268,004	—11.5
Mountain	3,744	—10.0	175,745	—14.0	130,955	—14.0	44,790	—14.0
Pacific	13,510	— 8.8	746,053	— 5.5	680,102	+ 1.4	65,951	—43.4

*By courtesy of U. S. Geological Survey, with deductions for operations not regarded as central-station operations. †Without adjustment for additional day in 1932.

Table III—Central-Station Financial Operations in the United States

Compared with Corresponding Month of Previous Year

Month	Total Gross Revenue from Sale of Energy*		Total Operating and Maintenance Expense†	
	1932 Thousands	Per Cent Inc.	1932 Thousands	Per Cent Inc.
Nov.	$169,730	— 6.9	$69,390	— 7.8
Dec.	171,880	— 7.5	72,350	— 8.8
	1933		1933	
Jan.	171,370	— 8.8	67,760	— 8.4
Feb.	158,620	— 9.4	64,460	— 9.5

*Aggregate gross revenue from consumers and from other utilities for energy for resale, involving a certain amount of duplication

†Does not include interest, taxes, depreciation or sinking fund, with some unavoidable exceptions.

The Ithaca Plan Proves Out

Results obtained in growth of load and improved trade relations indicate important experience for cities with rural territory.

UP IN central New York State, in the associated territory centering on Ithaca, the power company has been conducting a field experiment in co-ordinating all local agencies in the development of domestic load. It provides a detailed experience in the organizing of co-operative merchandising that should have guiding value to companies operating in small cities with extensive rural territory. The plan has the virtue of making the dealer a creative influence in the local market. At the same time it has materially increased the sale of load-building appliances and reduced the expenditure for new business operations. The plan would seem to point the way to a constructive solution of the problems of trade relations as they affect small communities.

The Empire-New York group of the Associated Gas & Electric System comprises the central New York properties. This district includes an area of 12,000 square miles covering nine key towns having a total population of 122,000. There are a number of other communities ranging from 1,000 to 2,000 people. The whole territory had about 350,000 inhabitants in the 1930 census. Connected to the company's lines are 30,000 combination gas and electric consumers and 30,000 customers using electricity only.

The rural area is agricultural, with vegetable, fruit, dairy, poultry and cattle feed farms predominating. There are factories employing normally about 50,000 workers. The power company has been selling appliances and in 1931 employed 63 merchandise salesmen in the field, and there were 354 appliance dealers in the territory. That year 73 per cent of the total load-building appliance sales were made by the power company and 27 per cent by the dealers. Of the sales by dealers, 60 per cent of the sales was made by the urban dealers and 40 per cent by the rural dealers. The territory is well served by wholesalers and distributors.

Preparing for co-operation

The status of dealer relations in 1931 was about the average for a territory of this kind. But in deference to the trend of sentiment, the power company decided to develop a co-operative program in which the dealer could be tied directly into the selling in the hope that these independent outlets could be developed into creators of load. As an approach to this, the company first made a careful market analysis of the territory served, to determine:

1. The saturation of appliances in wired homes.
2. The purchasing power of the market from the standpoint of population, income, buying habits, etc.
3. The number and character of the existing sales outlets.

Cards were made out for all customers in the territory. Salesmen were given from ten to fifteen names a day and instructed to call on each customer and find out:

1. Number, type and quality of appliances in the home.
2. Which of the appliances were purchased from dealers and which from the power company.
3. Apparent opportunity to sell additional appliances in that home.

These cards were tabulated and placed in a special file, which was thereafter kept up to date as a running inventory of customer equipment. Another card was made out for each dealer and a survey was conducted of all retail outlets, which presented:

1. Type of dealer—hardware or department store, electrical contractor or dealer, etc.
2. Net worth of dealer.
3. Appliances handled by dealer.
4. Dealer's ability to render service to the public—location, size of store, display space, etc.
5. Type and character of dealer—aggressive, backward, friendly, agitator, etc.

These data were supported with other information from state reports and the census. Out of the analysis came the following conclusions:

First—That the saturation of load-building items was about equal to the national average.

Second—That dealers sold only a small percentage of load-building items, but by far the greater percentage of vacuum cleaners, washers, etc.

Third—That aggressive dealers were not as bitter in their criticism as the "basket" or backward type of dealers were inclined to be.

Fourth—That the electrical industry was securing a small proportion of the consumer dollar spent in retail stores in comparison with sales of other industrial groups.

Fifth—That there was a lack of co-ordination of effort among electrical outlets in the market—jobbers, manufacturers, retailers.

Sixth—That the utility company's past merchandising policies have encouraged practices which were driving legitimate dealers from the field.

Seventh—That the utility company was the logical sponsor of co-operative effort among electrical outlets in the territory it served.

Out of these conclusions three definite objectives soon crystallized:

1. That the merchandising of appliances should be organized on a co-operative basis that would capitalize all potential allies, so that through group action the utility might increase its load and the dealers and distributors increase their earnings.
2. That the promotion of the market should be intensified and expanded by co-ordinating the advertising, store displays and field contacts of the power company and the dealers in support of all products included in the scope of the merchandising activity.
3. That all dissension in the marketplace should be eliminated by the co-operative discussion and solution of all the problems involved in the sale of appliances, through the modifying of policies before friction is caused.

Organizing the program

At the first move in this direction the company made a careful study of its own merchandising policies and modified them wherever necessary to conform to good trade practice and to satisfy all dealers and contractors that the new plan was co-operative in spirit, as well as name. A sweeping revision was made, involving trade-ins, discounts, resale prices, installation methods and

other factors, so that the dealers would be on an even basis of competition and be able to make a legitimate merchandising profit. Group meetings of dealers were held and the cards were all laid on the table. The program was explained and the dealers were equally frank in the discussion of the proposed basis for co-operative selling.

This plan was the joint product of two men—William J. Cashman and Fred S. Hoefer, both with the Empire-New York group of the Associated Gas & Electric System. Mr. Cashman is engaged in public relations activities, embracing dealer relations, employee education and other promotional work. Mr. Hoefer is assistant new-business manager in charge of the promotion of gas and electric domestic, commercial and industrial sales. They impressed upon the dealers the fact that competition between the power company and the dealer occurs only in the field, where 95 per cent of the company's sales are closed. They proposed to set up a system under which the dealers would register their appliance prospects on a special card, filed with the company, and it was pointed out that no dealer could expect to sell appliances successfully unless he knew his prospects and proceeded in some orderly way. This card constituted a competitive claim upon that prospect and the power company's salesman would assist in selling that prospect for the dealer.

This immediately established the co-operating dealers as part of a merchandising organization, embracing all potential sales outlets. It eliminated the incentive for competition. Company salesmen were made supervisors and given restricted territories. They were held responsible for the building of load in that territory and directed to sell for the company only where no competition was registered. Their compensation was provided on straight salary of $67.50 a month, with a bonus based on the estimated annual consumption of all appliances sold in their districts. This bonus was to be paid on all major load-building appliances put on the lines, whether sold by the dealer or by the power company representative, either for the company or the dealer's account.

The utility company sales manager, therefore, becomes responsible for the merchandising progress of all outlets in the territory. The company salesmen become not competitors with the dealers but colleagues, who assist the dealers to increase their own sales and are rewarded for it in their pay. Quotas were set up based on possibilities for both dealer and company sales.

Financial policies

Under the district manager, each of the nine operating districts in the Empire-New York group was divided into territories, each supervised by a representative of the company. Each takes his individual quota based on the character of his territory. He canvasses and solicits business for the company and keeps up a perpetual survey of appliances in homes. Wherever the dealer has filed a prospect card the company man helps the dealer sell for his own account, otherwise he sells for the company. He assists the dealers in his territory to display appliances, to co-ordinate their advertising and to educate their own salesmen. He supervises the dealer's merchandising efforts in every way he can to make them more productive.

The load-building bonus, which these sales supervisors receive in addition to their salaries, is based on the growth of load in the territory, estimated at 6 mills per kilowatt-hour yearly consumption of the appliance for the first 1,000 kw.-hr., plus 3 mills per kilowatt-hour for the excess over 1,000 kw.-hr. yearly consumption. The schedule of bonuses works out as follows:

Appliance	Estimated Kw.-hr. per Year	Bonus
Automatic water heater	4,000	$16.00
Automatic water heater (Dairy type)	1,000	6.00
Range	1,600	10.00
Refrigerator	600	3.00
Ironer	300	2.00
Pump (water system)	300	2.00

Commercial Refrigeration	Bonus
Bonus per compressor up to and including ¼ hp	$3.50
Over ¼ hp. and including ½ hp	6.00
Over ½ hp. and including 1 hp	9.00
Over 1 hp	12.00

All bonus payments are made at the end of the month in which the appliance is installed. They are paid entirely by the power company. Bonuses paid on sales that are canceled or repossessed by the company or dealer within three months are charged back. A car allowance of $20 a month is given to supervisors working in rural areas.

As the majority of the dealers desired to maintain their independence, in the matter of financing, a standard schedule of financing was worked out for company sales. This was in line with the service offered to the dealers by the reputable finance corporations. These terms were as follows:

Months	Per Cent	Months	Per Cent	Months	Per Cent	Months	Per Cent
3	5	8	7½	13	9½	18	12
4	5½	9	7¾	14	10	19	12½
5	5¾	10	8	15	10½	20	13
6	6	11	8½	16	11	24	15
7	7	12	9	17	11½		

Trade-ins were barred and a high standard of quality in appliances was established, based on the appraisal of the power company's testing laboratories in Rochester. Manufacturers' resale prices were to be maintained. The warehousing of stock was left in the hands of the wholesalers, with whom an active co-operation was developed. All wiring was to be done by regular contractors and installation jobs were to be allocated. Repair work was to be shunted to contractors and dealers, except where small jobs are done by the company for reasons of public relations, and labor is then billed at the same rate charged by the contractors. Uniform prices on range wiring were established at $50 per range and $20 for water heater installations. These prices were accepted as giving a fair profit to the contractor when the Associated Gas & Electric standard new service entrance installation is used. Dealers were to quote on an installed price basis to make the competition as comparable as possible.

Merchandising campaigns used

With this system established, the selling began. The power company proceeded with an intensive merchandising campaign, combining personal selling, co-operative advertising and co-operative displays, organized to promote the sales of company and dealers alike. Company advertising, instead of featuring particular appliances, began to promote the market for all and coined the slogan "See your local dealer." Dealers were assisted to

improve their advertising and tie it into the monthly campaign schedule that was arranged. Jobbers and manufacturers were encouraged to tie in also Sales helps were developed. Special co-operative displays were devised. Dealers were expected to display two major load-building appliances at all times. They were required to maintain facilities for servicing appliances.

Under this plan small appliances and larger appliances with small load value, such as the clothes washer and vacuum cleaner, are displayed in the company's showroom, but no effort is made to sell them. Terms are cash for all items sold for less than $10. This takes the utility company quite out of competition with the dealers on these non-load-building appliances. Obsolete and shopworn merchandise is disposed of co-operatively so as to eliminate all tendency toward price cutting.

At frequent intervals co-operative campaigns are featured on the important appliances. To stimulate dealer activity, all dealers are asked to set aside 5 per cent of the selling price, on all appliances sold through the assistance of the power company, to make a fund for advertising. And since dealers do not compensate the company's supervisors for the selling they do in the dealer's name, this is not burdensome. The company maintains a display service man to prepare display ideas for the dealers, who set up the displays with the help of the supervisors. Dealers also conduct displays in the company's showrooms, sales of their merchandise being for the dealers' account. A school has been organized for training dealers and their salesmen. A routine promotion has been established through group meetings, bulletins, reports and service letters to dealers, that gradually has brought them closer into the operation. The company's staff of home service women is made available for store or home demonstration and follow-up work on installations.

Representatives of the company's new-business department spend considerable time with the dealers suggesting improvements in selling and store keeping. In the beginning, of course, most dealers did not desire this type of assistance. But tactful persuasion and constant effort to assist brought results and have greatly strengthened merchandising methods in the territory. Many ideas have come out of these meetings of dealers, jobbers, manufacturers and utility men, which have been incorporated in the system. Regular meetings of supervisors and dealers' salesmen are a vital part of the routine.

Stimulating competition

The plan has capitalized the natural jealousy of competitors. When a dealer realizes that his competitor is going to take advantage of the power company's assistance he perceives that he must do the same. If the competitor hires men to sell for him, he must also have an outside sales force. The size of this staff need not be large, but inasmuch as the amount of selling assistance the dealer receives from the power company is proportional to the number of competitive contacts he makes in the field, it is important for the dealer to hire at least one outside man. In a word, the more salesmen a dealer has outside the more times he runs into utility competition. And the more he meets this competition the more the sales supervisor directs his selling effort to assist the dealer to make a sale. And the more of this assistance is given to the dealer the more sales he can make.

During these times real talent is available and the dealers can secure men for a straight commission of 10 per cent with a drawing account of $15 a week. In selling this idea to the dealers these five points were emphasized:

1. The dealer sales organization should consist of sufficient field representatives to cover the territory adequately.
2. It should be supervised by him, with the support and assistance of the utility company sales manager.
3. This organization should co-ordinate its activities with those of the utility company to utilize the assistance of the territory supervisors.
4. Dealer salesmen should attend all schools held for special sales training.
5. Dealer salesmen should attend regular sales meetings conducted for utility company supervisors.

A regular weekly report is required from each dealer covering all appliance sales. This comes to the company's new-business manager each Monday.

Results in figures

This system has now been operating in the Empire-New York group for more than half a year. It gives an interesting six months comparison between the results obtained with the present organized co-operation and power company leadership and the former unco-ordinated selling, when every man worked for himself in competition and conflict with every other dealer and with the power company.

Here are the figures based on the six-month period ended December 31, 1932, contrasted with the like period in 1931, in terms of major appliances sold and annual revenue attributable to increased load on the lines:

1. Number of Major Load-Building Appliances Installed

	Six Months Comparison		
Electric	1931 Company Sales	1931 Dealer Sales	1932 Combined Company and Dealer Sales
Ranges	218	21	306
Refrigerators	478	205	2,041
Automatic water heaters	55	3	93
Radios	152	0	1,539
Ironers	57	36	97
Water systems	20	149	281
Gas			
Ranges	354	290	1,103
Refrigerators	27	0	2
Automatic water heaters	188	41	264
Tank water heaters	52	132	105
Space heaters	43	7	37

2. Annual Revenue Attributable to Appliance Sales

	Six Months Comparison		
Type of Appliances	1931 Company Sales	1931 Dealer Sales	1932 Combined Company and Dealer Sales
Electric	$36,843	$32,910	$118,912
Gas	15,858	8,451	27,405
Total	$52,701	$41,361	$146,317
Annual kw.-hr. added	869,725	567,000	2,382,875
Annual M.C.F. added	10,572	5,634	18,270

3. Total Sales Value of Major Load-Building Appliances Sold

	Six Months Comparison			
Type of Appliances	1931 Company Sales	1931 Dealer Sales	1932 Company Sales	1932 Dealer Sales
Electric	$284,443	$130,000	$42,593	$600,000
Gas	68,393	30,000	15,127	100,000
Total	$352,836	$160,000	$57,720	$700,000

In this calculation, the value of the dealers' sales in 1931 is estimated, since no reports were made before the present co-operative plan was established.

Prior to the introduction of the "Ithaca plan" the power company employed 63 field merchandise salesmen, but last year 259 electric and 95 gas dealers were actively co-operating in the sale of appliances, with 122 electric and 58 gas merchandise salesmen in the field. The power company field staff was, therefore, reduced to 30 sales supervisors, and it is interesting to note that 23 of these men were able to increase their earnings during the last six months of 1932 by 20 per cent over the same months of 1931. All this brought saving in direct operating expense for the power company as follows:

4. *Canvassing and Soliciting Expense*

Type of Appliance	Six Months Comparison 1931	1932	Decrease
Electric	$61,992	$34,675	$27,317
Gas	19,783	15,959	3,824
Total	$81,775	$50,954	$31,141

5. *Direct Selling Expense*

including management salaries and expenses, advertising salaries, demonstrations, wiring and appliances, advertising supplies and expense, canvassing and soliciting expenses and miscellaneous—

Type of Appliance	Six Months Comparison 1931	1932	Decrease
Electric	$83,531	$48,664	$34,867
Gas	26,715	20,906	5,809
Total	$110,246	$69,569	$40,676
Dollar volume company sales	$352,836	$57,720	$295 116

At the same time by reducing merchandise sales of the company by the amount of $295,116 indirect expenses decreased also. It is estimated that by the elimination of losses on bad debts and the reduction in the collection, bookkeeping, handling and finance costs involved in this amount of business there was a saving of $36,000. Appliance inventories were reduced at the same time, from $87,000 to $37,000, which produced a further saving of $1,500 in indirect sales expense. There was, therefore, a net over-all saving like this:

6. *Over-all Saving in Operating Costs*

Six Months Comparison

Reduction in direct selling cost	$40,676
Reduction in indirect selling cost	37,500
Reduction in over-all selling cost	$78,176
Increase in gross merchandise profit 1931 over 1932	40,440
Net over-all saving in selling cost resulting from plan	$37,736

Other benefits

There are other collateral benefits to the power company also. For example, because a smaller proportion of the sales are made by the company, the dealers are now called upon to service a large proportion of the appliances. As the average annual cost of servicing electric ranges in this district is about $3 a range, this will amount to something. The company estimates that its servicing expense has been reduced about 30 per cent.

In 1931 the company spent $0.84 per dollar of gross revenue added and $0.058 per kilowatt-hour added. In 1932 these costs were $0.41 and $0.02 respectively. The indications are that during 1933 under the Ithaca plan the company will increase domestic kilowatt-hour sales at about twice the rate of 1931 at about half the cost. Its record of recent years on merchandise and kilowatt-hours sold annually per residence customer is as follows:

Electric Merchandise Sales—Empire-New York Group

Year	Net Volume	Sales per Domestic Customer
1930	917,047	$14.30
1931	721,622	11.30
1932	120,716	1.84

Annual Kilowatt-hours Sold per Domestic Customer

Year	Average Kw.-hr. Consumption per Domestic Customer	Per Cent Increase Over Previous Year
1930	425	11.0
1931	472	11.0
1932	519	9.1

It is interesting to note that this plan of co-operative merchandising was introduced in the Empire group at a time when dealer agitation was rapidly gaining momentum and when members of the trade were skeptical and difficult to organize. It was a time also when business was following a downward trend and it would have been logical to expect that 1932 would show a lower record of sales than 1931. At the same time appliance saturation was almost on a par with the national standard. The accomplishment, therefore, is the more notable.

It has put an end to friction within the electrical industry throughout the territory, because the policies of the power company and the dealers have been co-ordinated through harmonious group action. It has ended all tendency on the part of the utility company to usurp the functions of other branches of the industry. It has given the dealers new appreciation of their interdependence and their interest in the maintenance of sound merchandising practices. It has demonstrated that there must be a reasonable profit for each function properly performed in the industry, if the electrical business is to prosper. And the customer is to be well served.

It has shown, above all, that to effect a practical co-operation for the development of the electrical market there must be leadership and that that leadership can best come from the power company. Such a leadership, however, can only be established and exercised if the power company recognizes the part that dealer, contractor, wholesaler and manufacturer must play in a well-balanced system of distribution and is willing to throw in its lot with theirs.

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Cost of Transformer Service Crane

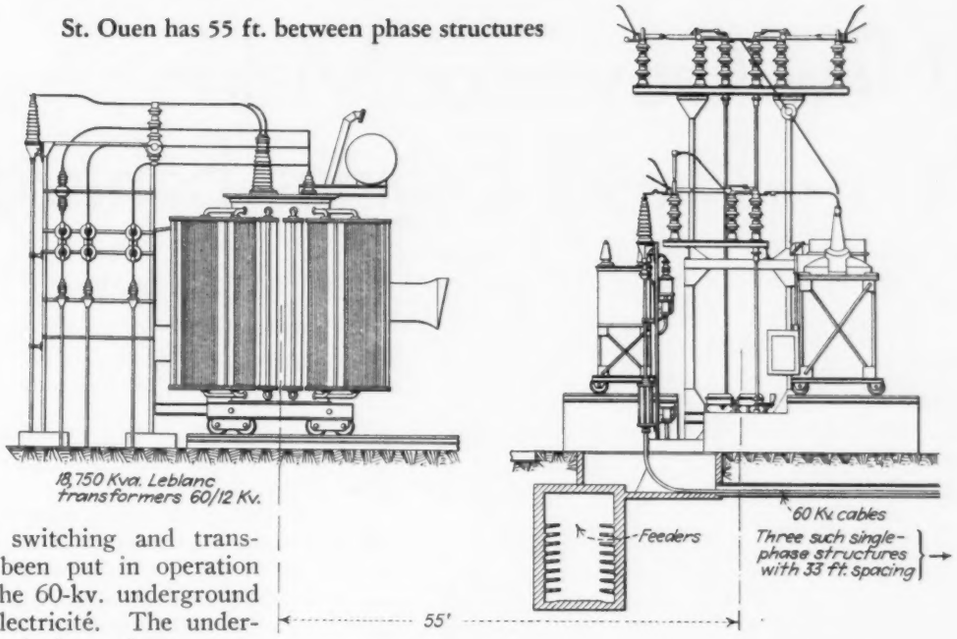
At the Comerford station of the New England Power Association system the step-up transformer banks consist of fourteen 13,000-kva., 13.4 to 230-kv., single-phase units. To facilitate maintaining these a 90-ton, 30-ft. span Philips & Davies crane was installed in a transformer service building at the end of the intake section of the dam, at the following itemized costs:

Labor	$516.33
Material	
One 90-ton traveling crane	14,500.00
Freight	335.52
One 2.5-ton hoist	131.38
One lifting beam	368.15
Miscellaneous supplies and materials	50.37
Traveling expenses	61.27
Miscellaneous	53.41
Total material	$15,500.10
Total cost	$16,016.43

Isolated-Phase Substations Used in Paris Area

By J. de CHAMBURE
Union d'Electricité, Paris

St. Ouen has 55 ft. between phase structures

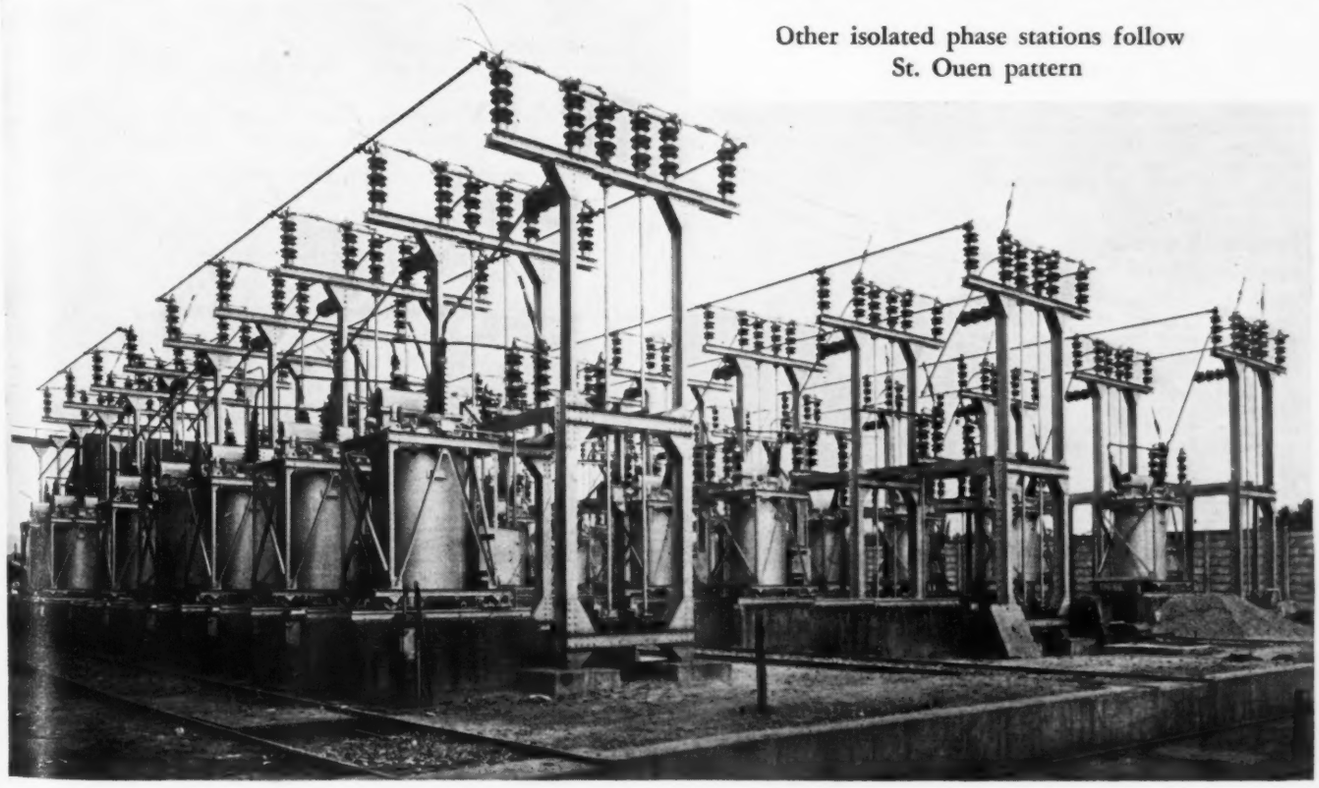


Several isolated phase switching and transformer substations have been put in operation during the past year on the 60-kv. underground system of the Union d'Electricité. The underground cables are of the single-conductor type, with resistance grounded neutral. In the cable system only a phase-to-ground fault need be feared, therefore the whole system could be freed of the hazard of phase-to-phase faults if the substations were designed on an isolated-phase basis.

To eliminate the equivalent of a phase-to-phase fault in the event of a two- or three-phase to ground arcover especial measures were taken to prevent incorrect switch operations. Each single-phase oil circuit breaker has independent solenoid mechanism, the three phases parallel operated by relays. The air disconnects are independently motor operated with the three switches of a line consecutively opened or closed with a definite intervening interval automatically maintained.

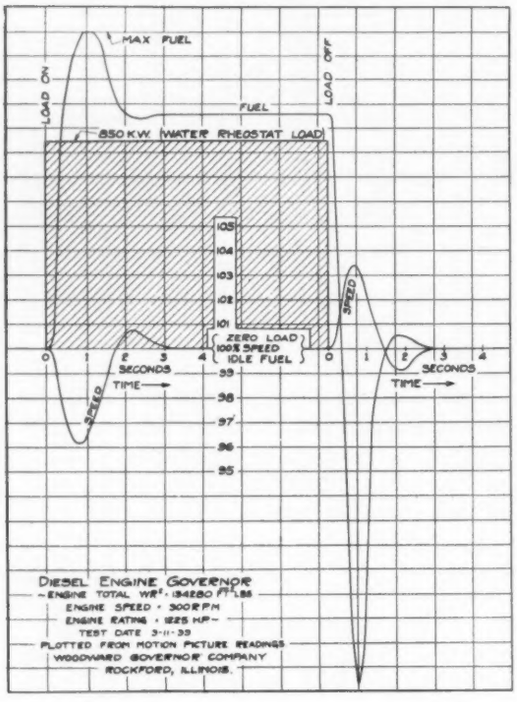
St. Ouen, the most important of the group of stations, is laid out for ten 25,000-kw., 60-kv. feeders. At present it has six installed. There are eight units of 18,750 kva. Leblanc transformers, which are 60 kv., three-phase, to 12 kv., two-phase. The transformers, breakers and switch apparatus were designed by the General Electric Company and built by Alsthom of Paris. The station layout is the joint work of the Union d'Electricité and the Société d'Electricité de Paris.

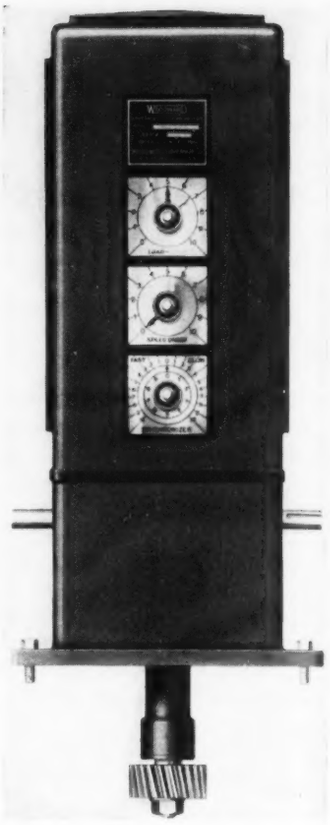
Other isolated phase stations follow St. Ouen pattern



New Governor Makes Diesel Engines Behave

By IRL C. MARTIN
Woodward Governor Company, Rockford, Ill.





New type Diesel governor

LACK of means for governing closely the speed of Diesel engines has been a difficulty that not only has made these engines troublesome to operate in parallel with other types of prime movers, but also has prevented them from giving complete satisfaction in voltage and frequency regulation when one or more of them is or are the only source of energy supply. The Diesel engine has been quite distinctly an individualist, a worker that works best alone and that does not get along well in a team. But from recent tests of a speed-control device developed by the Woodward Governor Company, on the same theory of operation as its hydraulic turbine governor, it appears that the rugged individualism of the Diesel engine can be considerably toned down and the engine made to perform very well indeed in double or any other kind of harness with other prime movers.

Stability under abrupt load changes

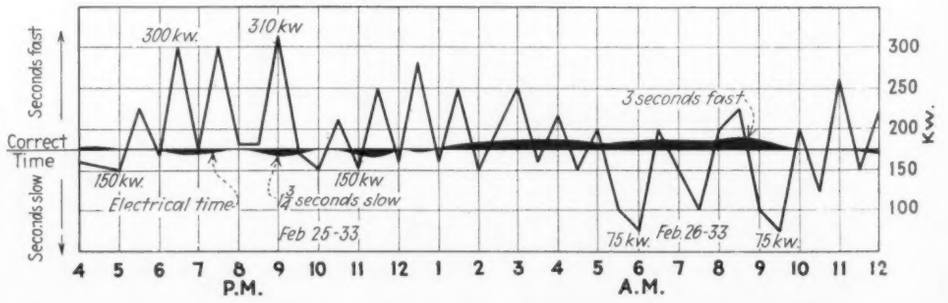
A water rheostat load of 850 kw. was slapped on, and after seven seconds tripped off a 1,330-hp., 300-r.p.m. engine controlled by the new governor. The chart shows that maximum speed changes, both high and low, were about 3½ per cent and speed was back to normal, after load trip, in approximately 2½ seconds.

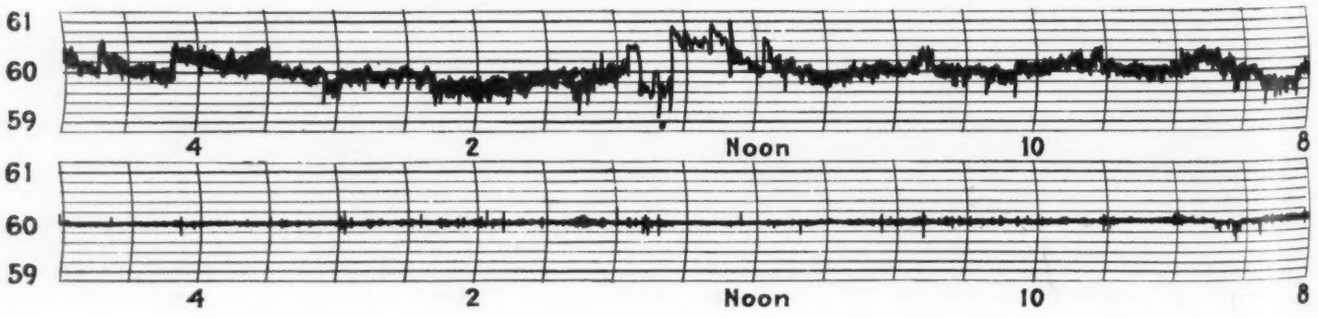
Frequency control much improved

Abrupt load changes from 50 to 800 kw. on a 1,225-hp. engine equipped with the usual type of Diesel governor caused the frequency variations of the upper chart. The same kind and size of load on the same engine, now controlled by the new governor, resulted in the steady frequency shown on lower chart.

Accumulated time errors are small

Here is the frequency regulation of a 420-hp. unit for twenty hours, during which time the governor, set at zero speed droop, received no manual adjustments or corrections.





After some experimentation in design and arrangement of parts, carried out on a 420-hp. engine last year, the new special type of Diesel governor was put together and installed on a 1,225-hp. engine last January.

The new governor is basically an isochronous device; that is, its response to speed changes is immediate. Previous Diesel governors have an inherent speed droop of from 3 to 6 per cent, that interval being the difference between no load and full load speeds. Speed droop is not a fault in a governor; as a matter of fact, certain amounts of it are necessary when engine units are operated in parallel. But it is a factor in governor operation that should be controllable within close limits and this is possible with the new device. With a number of Diesel units in parallel, the engine whose governor has no, or has least, speed droop will do all the regulating. If it is desirable to spread the regulation over two or more units their governors may be readily adjusted to the required speed droops to give this result. When clocks, time stamps and like devices are operated from energy circuits an isochronous governor on the prime mover, or on one of a group of them, is practically a necessity. How well the new governor performs in this respect is apparent from the time error chart.

Merits and Demerits of Electric Precipitators

The advantages and disadvantages of electric precipitators for flue-gas cleaning were summed up by H. E. Wallsom at a recent meeting* in Bristol, England, as follows, according to J. B. C. Kershaw:

If the velocity of the gas flow is reduced to about 6 ft. per second electrofilters are the most efficient for the elimination of dust from flue gases, for it is not an exaggeration to say that with this type of apparatus, when efficiently operated, there is no visible escape of dust from the stack. An efficiency of dust extraction of between 94 and 98 per cent is possible, but 90.5 per cent may be taken as the average figure. The following figures of a screen analysis prove that electrical precipitation does bring about the settling of material, designated as "fumes"; that is, of particles less than 10 microns in size.

Mesh (I.M.M.)		Per Cent
Over	40	Nil
Through	40	100.00
	100	96.22
	200	79.68
	300	71.51
	600	69.88
	1,000	54.54

**Institute of Fuel and Society of Chemical Industry at Bristol University.*

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Connected Loads and Demands of Anthracite Breaker Power Applications

(Applies to St. Nicholas, Pa., breaker of Philadelphia & Reading Coal & Iron Company. See ELECTRICAL WORLD, April 15 and 22).

The figures for connected kilowatts include the losses in the motors, transformers and feeders, so that the connected kilowatts may be considered at the main switchboard. Motor types and voltages are, with a few exceptions, as follows:

500 to 350 hp.— 2,200 volt, three phase, synchronous.
250 to 150 hp.— 2,200 volt, three phase, induction.
100 to 5 hp.— 440 volt, three phase, induction.
3 to 1 hp.— 220 volt, three phase, induction.
¾ to 1/20 hp.— 220 volt, one phase, induction.

The demand factors of individual items are based, in most cases, on actual tests of similar equipment. Some of those which appear particularly low are the result of selecting oversize motors in order to secure sufficient starting torque as discussed in the previous articles. Others are due to necessity of designing and motoring certain machines for surges that may occur in the flow of coal. The total breaker demand is 3,600 kw. at 0.985 power factor measured by recording instruments over a period of two hours at the main switchboard with both halves of the breaker in operation, producing approximately 1,000 long tons of refined coal per hour.

Item	Quantity	Rating Hp.	Connected Hp.	Connected Kw.	Demand Factor	Demand Kw.
Cone agitators	10	15–40	270	268	15	40
Gate and valve solenoids	30	¼ (kw.)	—	7	10	1
Refuse detectors	6	¾	5	6	60	4
Sand pumps	24	15–100	1,240	1,086	55	597
Belt conveyors	15	7½–300	653	553	70	395
Belt cleaners	2	3	6	6	80	5
Flight conveyors	12	7½–40	225	207	50	104
Screw conveyor	1	15	15	14	70	10
Drag conveyor	1	5	5	5	40	2
Chain conveyor	1	5	5	5	20	1
Bucket elevator	1	10	10	9	45	4
Apron feeders	7	5–15	15	47	40	19
Shaking feeders	18	3–15	135	127	35	44
Reciprocating feeders	7	5–7½	40	38	25	9
Rotary feeders	4	3	12	12	25	3
Scalping screens	12	15–40	280	255	50	127
Feed screens	5	10–20	80	74	45	33
Sizing screens	18	5–30	365	335	35	117
Desilting screens	10	5–15	90	85	30	25
Dewatering screens	8	5–7½	45	43	30	13
Refuse screens	8	15–20	140	130	25	32
Sand screen	1	5	5	5	0	0
Roll crushers	9	15–25	205	185	22	41
Circulating water pumps	4	350–500	1,700	1,371	60	823
Flushing pumps	2	150–300	450	370	20	74
Spray pumps	2	150	300	249	60	149
Sump pumps	11	¼–50	170	154	45	69
Car wash pump	1	40	40	36	70	25
Gland seal pumps	2	25	50	45	80	36
Hydrotator drives	5	1–25	55	51	70	36
Air compressors	3	150	450	373	45	168
Compressor pump	1	2	2	2	70	2
Dust removal fans	3	15–20	50	46	65	30
Ventilating fans	16	1/20–2	6	7	40	3
Car pullers	10	10	100	93	10	9
Diverting gate solenoids	8	¼ (kw.)	—	2	0	0
Plow hoists	4	¾	3	3	0	0
Loading boom hoists	4	4	16	15	10	1
Loading chute hoists	4	2	8	9	10	1
Welder receptacles	8	30	240	216	15	17
Unit heaters	33	1/20–3½	26	29	0	0
Water coolers	4	1/6–¾	2	2	0	0
Freight elevator	1	27	27	25	10	3
Machine tools	10	1–5	24	25	20	5
Laboratory oven	1	30 (kw.)	—	30	20	6
Pulverizers	2	1	2	2	0	0
Grinder	1	5	5	5	20	1
Furnaces	2	2½ (kw.)	—	5	20	1
Rotary car dumper	1	60	60	53	20	11
Heating return pump	1	2	2	2	0	0
Car retarder	1	¼ (kw.)	—	—	0	0
Car retarder compressor	1	5	5	5	70	3
Magnet hoist	1	12	12	12	0	0
Box car clamp	1	20	20	18	0	0
Box car tip	1	50	50	44	20	9
Thickener agitator	1	7½	7	7	70	5
Slurry agitator	1	15	15	14	60	8
Traveling screen	1	5	5	5	70	3
Sludge pumps	3	250	750	615	39	240
Pneumatic tube compressor	1	3	3	3	30	1
Motor generators	2	450	900	722	30	217
Signal lamps	189	–	—	2	40	1
Signal horns	21	–	—	1	0	0
Signal bells	18	–	—	—	0	0
Lighting lamps	900	100–500 (w)	—	170	10	17
Totals			9,401	8,340		3,600

Generation at 33 Kv. Proved by Performance

By J. ROSEN*

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With a "let's look at the record" substantiation of 33-kv. generators, the author foresees a demand for alternators of 66 kv. While that waits fulfillment, the immediate possibility exists of using 2/1 auto-transformers (following the Hudson Avenue 27.6/13.8-kv. scheme) to derive 66 kv. from 33 kv. alternators without entailing double-winding transformers.

ABOUT four years ago† ELECTRICAL WORLD referred editorially to the question of generating voltages in the following striking phrases: "Generators ever grow in size, transmission lines ever grow in length and voltage, but the generator voltage remains forever. . . . Is there a law of nature or a constitutional amendment against the use of a generator voltage of over 13,800? . . . In the near future many utilities will no doubt request manufacturers to bid on 33,000-volt units and manufacturers will find means to build such units. . . . The 33,000-volt generator will come as the result of the recent tendency of public utilities to simplify their stations. It will eliminate troublesome transformation and unnecessary switching." Even while this prophecy was being penned it was already in course of fulfillment. It appeared, indeed, almost simultaneously with the inauguration of the change of practice which it foretold, and of which the advantages are now becoming more and more fully recognized.

The 13,800 volts which would appear to have been the limiting pressure at the time referred to was soon exceeded in the United States. For the 208,000-kw. unit put into service in the State Line power station in 1929 a pressure of 18,000 volts across the terminals of each of the three generators was originally proposed, but the advantages of a higher pressure became so evident that the unit was actually constructed to generate at 22,000 volts. The same pressure was adopted for the 61,765-kva. alternators built by the General Electric Company for the Super-Power Company of Illinois and also, the writer believes, for the latest 125,000-kw and 150,000-kw. units for the State Line Generating Company. As regards practice in Great Britain, it may be mentioned that although the 1,500,000-kva. turbo-alternator supplied by C. A. Parsons & Company, Limited, for testing switchgear at the works of A. Reyrolle & Company is wound for 22,000 volts, this voltage has not been favored for power station machines. The tendency has been rather to go at once to the generally more advantageous figure of 33,000 volts.

The development of turbo-alternators to generate directly at pressures of 33,000 volts and over has been brought about by both economic and technical considerations. The designer saw in higher voltages the natural solution of the problem of building ever more powerful and more efficient machines, while the power station engineer, once he was satisfied that he would lose nothing in reliability, saw that he had everything to gain by generating current at the voltage at which he needed it. Although the high-voltage turbo-alternator is a product of the last few years only, machines of this kind are now in use, or will be very shortly, by five separate undertakings. All are designed for a working pressure of 33,000 to 36,000 volts. The pioneer machine was supplied by the firm with which the writer is associated to the Brimsdown station of the North Metropolitan Electric Power Supply Company in August, 1928. It had a rated capacity of 25,000 kw. at 3,000 r.p.m. and so satisfactory was its performance that in 1931 a second machine of the same type and size was ordered for the same station. Both sets are now in regular and uneventful service.

About this time interest in high-voltage generation began to be manifested on the Continent of Europe, and in 1931 a 25,000-kw. turbo-alternator was built by Messrs. Brown, Boveri & Company, Baden, Switzerland, for the Langerbrugge station in Belgium. This machine was the subject of an interesting article by F. R. Sidler in the ELECTRICAL WORLD of October 16, 1932. Circumstances in no way connected with the machine have, unfortunately, prevented it being put into service. No further developments, so far as the writer is aware, have

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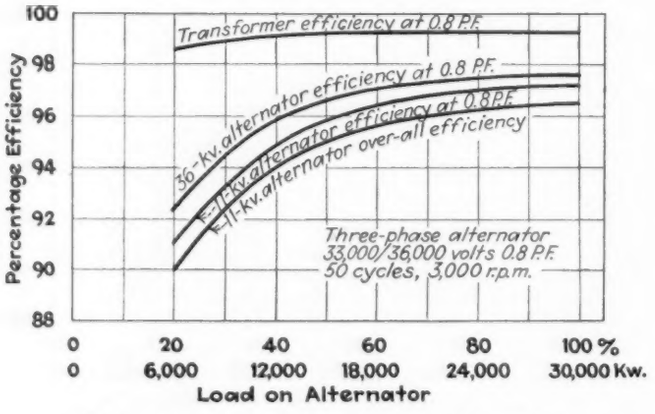
†January 19, 1929.



Gain of 1 per cent in efficiency with 33 kv.

Almost half the gain is in the superior efficiency of the alternator itself and the rest in eliminating the losses in the transformer needed with 11-kv. generation.

The outer conductor comprises one-third the coil sides per phase connected in series, starting from zero or neutral potential. The 11 to 22-kv. potential level is generated by the intermediate conductors connected in series with one another and the group in series with the group of outer and inner conductors. Each layer of insulation is thus subjected to only the same 11-kv. stress it would encounter in an 11-kv. alternator of conventional design.

Triple-concentric stator conductors control flux gradient in mica insulation

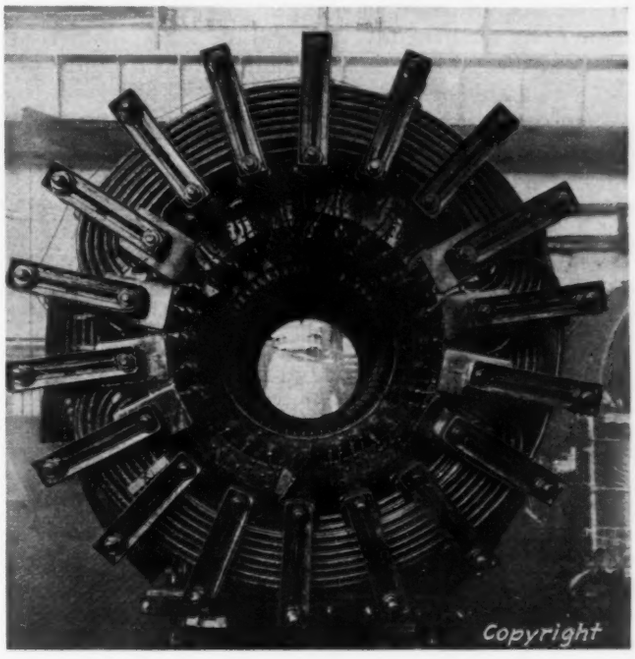
taken place on the European Continent, but early last year the corporation of Capetown ordered a 20,000-kw. Parsons high-voltage generating set, which has now been shipped to the Salt River power station of the Electricity Commission of South Africa. A duplicate plant has since been ordered by the Electricity Commission of South Africa. An 18,000-kw. alternator at 35,000 volts to replace, on the same bedplate, an existing machine wound for 11,000 volts is now being completed for a power station in South Wales.

200,000 kw. committed to 33 kv.

All the foregoing high-tension alternators were destined for service in existing stations alongside units of ordinary voltage, but when equipment of the new superstation at Swansea was decided on it was determined to generate exclusively at high voltage from the start. The Heaton Works were therefore intrusted with the construction of a pair of 30,000-kw., 3,000-r.p.m. turbo-generators to work at a pressure of 33,000 to 36,000 volts. There are thus already in existence or in process of manufacture for central-station work eight high-voltage turbo-generators of an aggregate output of 200,000 kw., of which four machines aggregating 125,000 kw. have been ordered during the last twelve months.

This rapidly increasing popularity of the high-tension generator is due mainly to two facts; it is considerably cheaper in first cost, and at the same time it is more efficient than the old arrangement of a low-tension machine coupled to a transformer. Not only are the transformer losses abolished and a risk of the introduction of harmonics into the system eliminated, but a 33,000/36,000-volt generator can be built with an inherently higher efficiency than a low-voltage machine of the same power. The difference in the case of a 30,000-kw. alternator at 80 per cent power factor will be about 0.3 per cent in favor of the high-tension machine at full load, or 1.0 per cent if the transformer losses are to be taken into account. At partial loads the differences in favor of the high-tension machines are, of course, substantially greater.

The higher efficiency of the system of high-voltage generation would alone have been sufficient, in many cases, to turn the scale in its favor, but when engineers realized in addition the saving of money and space due to the elimination of the step-up transformers, and the simplification consequent upon the reduction in size and number of the cables to be brought out from the machine, the issue was no longer in doubt. In a discussion on high-voltage generators by the British Institution of Electrical Engineers in London on January 29, 1929, Capt. J. M. Donaldson, the chief engineer of the North Metropolitan Electric Power Supply Company, stated that the savings effected on all counts by the installation of the first high-tension machine at Brimsdown were equivalent to a reduction in capital cost of more than 10 shillings ($2.43) per kilowatt of capacity as compared with an ordinary plant.



Fibrous braces replace iron for end-connection supports. Efficiency improved, handling facilitated and noise reduced

The long period of stagnation in turbo-generator voltages referred to at the commencement of this article was due to two causes: First, a fear of insulation difficulties, and, second, the ease with which any required transmission voltage could be obtained by means of transformers. Engineers still remembered the trouble with the early 11,000-volt machines arising from the formation of ozone and oxides of nitrogen and were consequently shy of any great advance in generating voltages. The flexible type of mica insulation developed by the author's firm in 1913 would have allowed higher voltages to be employed at that date, but it was felt that the maximum steeper potential gradients which would have been involved by increasing the thickness of the insulation were better avoided.

So the matter rested until the design of high-voltage machines was made the subject of a special study in 1921. It was then decided that the best solution of the problem was to be found in the use of conductor bars in the form of triple-concentric, mica-insulated cables, the outer and intermediate conductors of which would act as intersheaths as well as generating voltage and carrying current. By this device no insulation need be called upon to carry any higher stress than in an ordinary low-voltage

machine. Before a 33,000/36,000-volt alternator was constructed on this principle full sized conductor bars were tested continuously for more than two years under conditions similar to those which would exist in a machine generating 57,500 volts between phases, the conductors being electrically heated to 90 to 110 deg. C. during the day and allowed to cool off at night. No deterioration whatever of the insulation could be detected.

An objection often raised against the principle of generating directly at the transmission voltage is that the old practice of inserting a transformer between the busbars and the generator protects the latter against the effects of surges and short circuits on the transmission lines. This argument is easily met. In the first place the high-voltage alternators are designed to have the same reactance as that of an ordinary machine together with that of its transformer, so that the short-circuit current will be limited to the same multiple of the full-load current in either case. The shock, moreover, must be taken at some place, and the windings of the high-voltage machine with concentric stator bars are even better fitted to withstand it than are the windings of an ordinary step-up transformer.

End stresses greatly reduced

It must also be remembered that, owing to the smaller currents to be carried, the forces on the end windings of a high-voltage generator are very much less than the corresponding forces in a low-voltage machine. It can be shown by calculation that by raising the voltage of generation from 11,000 to 36,000 a reduction of more than 75 per cent in the forces per foot run on the end connections between phases and of more than 85 per cent in the forces between adjacent turns can be readily secured. All high-voltage turbo-alternators are, of course, subjected to sudden short-circuit tests across their terminals at full voltage before they leave the works.

In connection with the question of the protection which a transformer can give to an alternator, reference may be made to an article by W. A. McMorris of the transformer department of the General Electric Company published in ELECTRICAL WORLD, September 24, 1932.

In this article it is stated that both theoretical and experimental studies, substantiated by field work, have shown that surges due to lightning can be and are transmitted through a transformer to the running machinery, the impedance of the transformer opposing no sensible barrier to the surge. The subject is a controversial one, but if Mr. McMorris' conclusions are accepted, it would appear that a high-voltage alternator must be less severely stressed by a lightning surge than a low-voltage alternator and transformer combined.

Brimsdown installation quickly duplicated

The best proof, however, of the needlessness of a transformer to protect a high-voltage generator is to be found in the experience at Brimsdown. The first of the two high-voltage alternators in this station has now been working continuously for about 4½ years at a pressure of about 34,500 volts. It feeds directly into an overhead system extending for 60 miles and connected by long underground cables to an overhead system of another company. Very soon after its installation an unprecedented series of faults occurred on the transmission lines, resulting in almost daily surges up to short-circuit intensity. No harm whatever was done to the machine, which, when opened up for a thorough examination after three years of service, was found to be in perfect condition. It should be noted that, contrary to certain statements which have gained currency, this machine is working, and has always been working, with its neutral point insulated from earth, so that the conditions in the event of a fault on the system are the severest possible.

The second high-voltage alternator at Brimsdown, though identical in general design with its predecessor, embodied an improvement which is now being incorporated in all high-voltage machines. This consists in the use of end shields of a fibrous material instead of the usual cast iron. The new type of end shield, being non-magnetic and non-conducting, enhances the efficiency of the alternator by the avoidance of eddy currents. For the same reason the shields can be attached rigidly to the end-winding bolts, a procedure which conduces to silence in operation. Their lightness, moreover, is a considerable convenience when it is desired to open up the machine for examination.

The next step is 66 kv.

The next few years will almost certainly see a demand for turbo-alternators to generate directly at 66,000 volts. The development of the concentric conductor principle has already brought them within the range of possibility. Meanwhile, however, it may be pointed out that the existence of the 36,000-volt generators makes it practicable to attain a transmission pressure of 66,000 volts by means of auto-transformers. While this would not be so economical as direct generation at the higher pressure, it would be both much cheaper and more efficient than the present practice of using ordinary low-voltage generators and double-wound transformers.

The advantages of using auto-transformers in connection with large generating sets is already appreciated in the United States, and credit must be given to the initiative of American engineers in this field. An outstanding example of this practice is afforded by the 770,000-kw. Hudson Avenue power station of the Brooklyn Edison Company. Here the original generators designed for 13,800 volts and the latest 16,500-volt generators of 160,000-kw. capacity are all stepped up to the busbar pressure of 27,600 volts by means of auto-transformers, without any intermediate switching. The duplication of the generator voltage by this method on so large a scale should remove the last doubt as to the feasibility of attaining a transmission pressure of 66,000 volts from 36,000-volt generators in the same way.

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Addressograph for Demand Readings

Using for meter readings the addressograph that is applied to the bills is a practice followed by some utilities. H. L. Thomson, Hartford Electric Light Company, has hit upon the novel and simple scheme of handling demand register indications on the same system. Below the name, address, route, code, etc., he prints three 1's, the end ones separated from the middle one by four dots. The meter reader puts an arrow pointing to the dot corresponding to the scale position of the demand pointer and then labels the 1's to correspond to the scale marking. This avoids the necessity of estimating fractional division values. It also serves as a permanent record of the reading.

Lighting for Office Buildings

By W. E. MALM*
President Building Owners and Managers' Association

Rental values determined by light. Suggests better controls for lighting. Building managers' viewpoints on lighting.

THE improvements in illumination design and the wide publicity given to light values in their relation to increased vision and comfort have made the office building tenant "light conscious" and the old accepted standards of 1½ to 2 foot-candles for general office work have been supplanted by demands for 8 to 10 foot-candles. The impulse from each advance in the art of lighting is not long delayed in traveling from the source to our industry, and we are made conscious of each new development by tenant demand, as well as from competition of the new building whose wiring capacity is ample to meet the increased demand, but the older building with inadequate capacity is faced with a modernization of its distribution system in order to meet increasing requirements.

Cost of electrical energy for lighting purposes is an important factor in the operation of buildings, as is clearly demonstrated in Fig. 1, which shows distribution of electrical energy in a modern office building. Applying a factor of 1.869 kw.-hr. (90 per cent of 2.077 kw.-hr.) per square foot per year to net rentable area in the buildings of our association (approximately 385,000,000 sq.ft.) at an average unit cost for electric current of 1.74 cents per kilowatt-hour produces the sizable bill for this utility of close to $12,500,000. If we adjust this amount to include the requirements for mercantile occupancies the cost will approximote $30,000,000. When we deal with illuminating costs approaching this volume economies are of first importance.

A few further examples presented in hasty review will demonstrate some of the problems of maintaining adequate illumination levels in office buildings. The accompanying table represents the results obtained from tests conducted in one of our modern skyscrapers for the purpose of determining the variation in the cost of lighting offices under different conditions of use, occupancy and exposure. The location of the offices under test was at approximately the same elevation in the building, contained about the same floor and window areas, but subject to varying natural light conditions.

Office "J" cannot be considered as average tenancy due to the long hours of occupancy, but many buildings have tenants of this type. Excluding this office from the comparison, it will be noted the kilowatt-hour consumption per square foot ranged from 0.695 to 5.237 and the percentage of the cost of current in its relation to the annual rent paid by the tenant varied from 1.98 to 8.06 per cent. The tenant paying for the larger consumption, however, was more than compensated for this increase in the cost of electrical energy, resulting from the lack of daylight, as he enjoyed a lower rental rate as a result of this condition. Although the electric current bill of tenant "G" was $58.22 more than that of tenant "B," his annual rent was $300 per year less. Although the two offices illustrated are of the same area, the difference in rental return is wholly attributable to the absence of sufficient natural light, and until the illuminating engineer can match daylight by artificial means, this condition will maintain in evaluating office space.

Abstract of paper presented at the Lighting Conference, Case School of Applied Science.

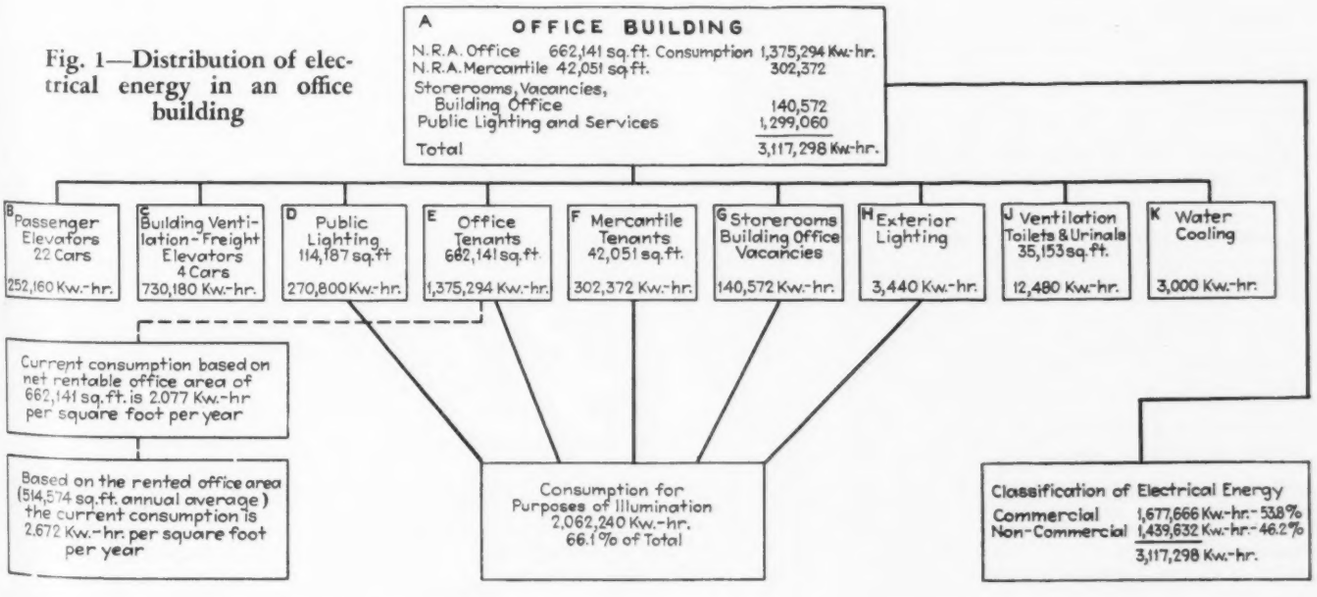
A OFFICE BUILDING
N.R.A. Office 662,141 sq.ft. Consumption 1,375,294 Kw.-hr.
N.R.A. Mercantile 42,051 sq.ft. 302,372
Storerooms, Vacancies, Building Office 140,572
Public Lighting and Services 1,299,060
Total 3,117,298 Kw.-hr.
B Passenger Elevators 22 Cars 252,160 Kw.-hr.
C Building Ventilation-Freight Elevators 4 Cars 730,180 Kw.-hr.
D Public Lighting 114,187 sq.ft. 270,800 Kw.-hr.
E Office Tenants 662,141 sq.ft. 1,375,294 Kw.-hr.
F Mercantile Tenants 42,051 sq.ft. 302,372 Kw.-hr.
G Storerooms Building Office Vacancies 140,572 Kw.-hr.
H Exterior Lighting 3,440 Kw.-hr.
J Ventilation Toilets & Urinals 35,153 sq.ft. 12,480 Kw.-hr.
K Water Cooling 3,000 Kw.-hr.
Current consumption based on net rentable office area of 662,141 sq.ft. is 2.077 Kw.-hr per square foot per year
Based on the rented office area (514,574 sq.ft. annual average) the current consumption is 2.672 Kw.-hr. per square foot per year
Consumption for Purposes of Illumination 2,062,240 Kw.-hr. 66.1% of Total
Classification of Electrical Energy
Commercial 1,677,666 Kw.-hr.- 53.8%
Non-Commercial 1,439,632 Kw.-hr.- 46.2%
3,117,298 Kw.-hr.

Fig. 1—Distribution of electrical energy in an office building

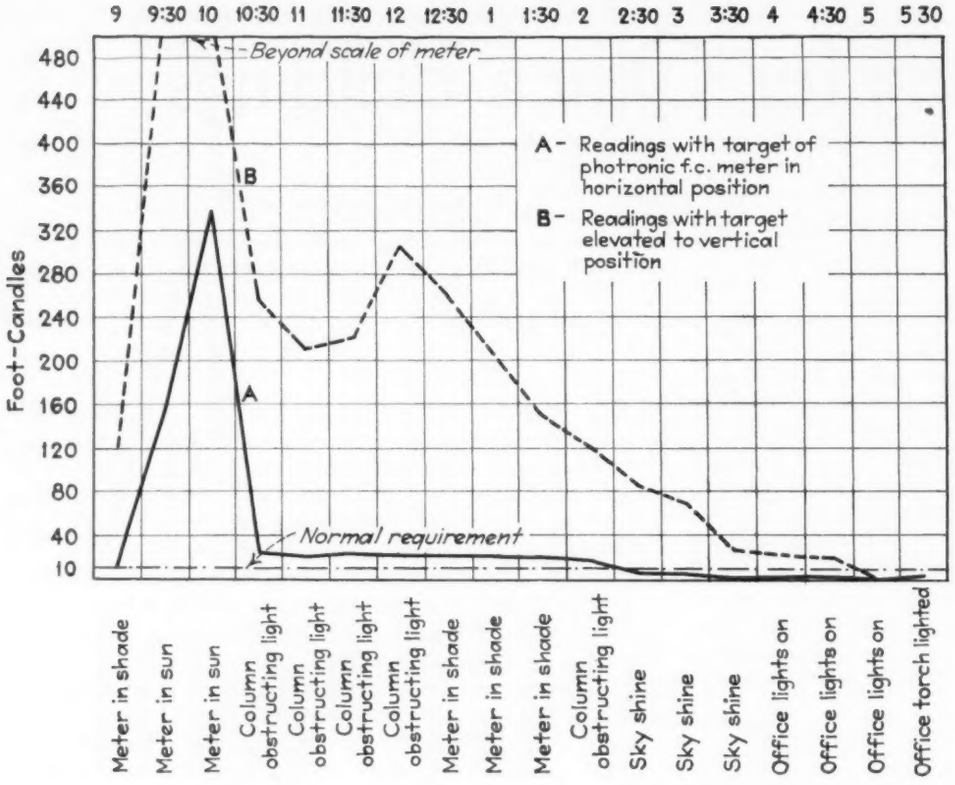

Fig. 2—Variation in light conditions in an office that suggests automatic control

It would be comparatively easy to multiply such illustrations manyfold from the point of view of the general influence of illumination in "selling of space," but such appreciation is well recognized and needs no further elaboration. In the operating of office buildings we are conversant with the loss in light transmission, due to improper cleaning of fixtures and globes and the necessity of providing adequate levels of illumination, but such problems are within the scope of proper operating methods. Improvements, which we desire in the field of artificial illumination, relate more particularly to regu-

Comparative Table Showing Variation of Electrical Energy Consumption in Office Space

Type of Occupancy	Office "A" Estates Office		Office "B" Trade Ass'n		Office "C" R.R. Office		Office "D" Attorneys		Office "E" Investments		Office "F" Attorneys		Office "G" Insurance		Office "H" R. R. Office		Office "J" Service Office	
Size	18x27 ft.		18x20 ft.		17x22 ft. 4 in.		17x28 ft. 6 in.		17x22 ft. 6 in.		18x24 ft.		18x20 ft. 6 in.		18x17 ft.		17x20 ft. 2 in.	
Area, square feet	485		363		380		483		381		429		367		307		343	
Rent month	$145.00		$110.00		$100.00		$140.00		$110.00		$100.00		$85.00		$75.00		$85.00	
Rent annual	1,740.00		1,320.00		1,200.00		1,680.00		1,320.00		1,200.00		1,020.00		900.00		1,020.00	
Square foot rate	3.58		3.63		3.15		3.47		3.46		2.79		2.78		2.93		2.97	
Exposure	Street		Street		Street		Street		Street		Street		Court		Court		Court	
Natural light	North		North		West		West		West		South		North		South		East	
Windows — No. and size	2 (57x78 in.)		2 (55x78 in.)		2 (53x78 in.)		2 (53x78 in.)		2 (53x78 in.)		2 (49x78 in.)		2 (57x78 in.)		2 (57x78 in.)		2 (55x78 in.)	
Electric fixtures	4		2		3		3		3		3		4		2		2	
Type — 16 in.	Semi-indirect		Semi-indirect		Semi-indirect		Semi-indirect		Semi-indirect		Semi-indirect		Semi-indirect		Semi-indirect		Semi-indirect	
Wattage of fixtures	1000		500		600		600		600		700		1000		400		600	
Fixture wattage per sq.ft.	2.06		1.41		1.57		1.24		1.57		1.63		2.72		1.30		1.72	
Current Consumption, Charges 1st 40 kw.-hr. 0.05 Next 200 kw.-hr. 0.04 Balance 0.028	Kw.-Hr.	Dollars	Kw.-Hr.	Dollars	Kw.-Hr.	Dollars	Kw.-Hr.	Dollars	Kw.-Hr.	Dollars	Kw.-Hr.	Dollars	Kw.-Hr.	Dollars	Kw.-Hr.	Dollars	Kw.-Hr.	Dollars
December, 1931	80	3.60	46	2.24	69	3.16	63	2.92	37	1.85	65	3.00	180	7.60	87	3.88	302	11.73
January, 1932	66	3.04	42	2.08	71	3.24	63	2.92	40	2.00	56	2.64	173	7.32	81	3.64	301	11.70
February, 1932	86	3.84	57	2.68	71	3.24	69	3.16	56	2.64	68	3.12	190	8.00	99	4.36	321	12.26
March, 1932	87	3.88	47	2.28	59	2.76	66	3.04	28	1.40	66	3.04	166	7.04	91	4.04	271	10.86
April, 1932	86	3.84	48	2.32	67	3.08	61	2.84	20	1.00	64	2.96	171	7.24	85	3.80	288	11.34
May, 1932	67	3.08	48	2.32	66	3.04	55	2.60	12	0.60	61	2.84	166	7.04	85	3.80	274	10.95
June, 1932	39	1.95	51	2.44	55	2.60	54	2.56	7	0.35	58	2.72	147	6.28	86	3.84	294	11.51
July, 1932	28	1.40	34	1.70	43	2.12	47	2.28	7	0.35	58	2.72	122	5.28	62	2.88	315	12.10
August, 1932	13	.65	31	1.55	38	1.90	40	2.00	6	0.30	67	3.08	155	6.60	55	2.60	364	13.47
September, 1932	19	.95	23	1.15	40	2.00	41	2.04	12	0.60	61	2.84	146	6.24	53	2.52	325	12.38
October, 1932	38	1.90	26	1.30	43	2.12	53	2.52	17	0.85	63	2.92	150	6.40	50	2.40	300	11.68
November, 1932	59	2.76	28	1.40	59	2.76	61	2.84	23	1.15	66	3.04	156	6.64	72	3.28	345	12.94
Total twelve months	668	30.89	481	23.46	681	32.02	673	31.72	265	13.09	753	34.92	1,922	81.68	906	41.04	3,700	142.92
Kw.-hr. consumption per sq.ft. per year	1.377		1.325		1.792		1.389		.695		1.755		5.237		2.951		10.078	
Ratio annual current charges to annual rent	1 : 56.3		1 : 56.3		1 : 37.4		1 : 52.9		1 : 101.5		1 : 34.3		1 : 12.4		1 : 21.9		1 : 7.1	
Electric current charges, per cent of annual rent, per cent.	1.77		1.77		2.67		1.89		0.98		2.91		8.06		4.56		14.08	

Offices A, B, C, D, E and F represent a cross-section of the building tenancy. The offices are used during normal office hours of from 8:30 a.m. to 5:30 p.m. The offices face relatively wide streets, are approximately the same size, have the same area of glass exposure and have ideal natural light conditions. Offices G and H have normal hours of occupancy, but due to their location on the inside court of the building do not have adequate natural illumination. Office J is occupied by a service company, catering to the moving picture industry, and the office is operated during a sixteen-hour period—from 8 a. m. to 12 p. m. The office is located on the inside court of the building with poor natural lighting facilities.

lation and control, and not so much to the physical properties of light emission.

Our buildings are now super-mechanized in maintaining proper conditions of humidification and thermostatically controlled heat sources. Our elevator systems are perfected to a point where the next advance appears to be robot operation. We have attempted to eliminate the personal equation in every phase of our operation by introducing automatic control, but in our illumination we still compete with the solar system by drawing shades and pushing buttons.

Better control needed

Since the emergence of the photoelectric cell from the experimental stage into the field of industry we have fostered the hope that herein rested the solution of one of our most perplexing problems, whereby we could control and maintain efficient levels of illumination by relatively inexpensive means. My temerity in broaching this subject, as well as my confidence in the ability of the illuminating engineer to apply it in a practicable and economic manner to our industry, may be excused on the grounds of ignorance of the problems involved. From my superficial knowledge of the work which is being done in this field, having as its objective the application of photronic devices to light control in office buildings, it would appear that the practical side of the problem is somewhat overlooked in an effort to develop too high a degree of refinement and efficiency of operation in the controlling devices. Our industry does not require light regulation that is confined to a narrow scale, but one that has rather broad limits. While it is desirable to maintain an illumination level of 10 foot-candles for general office purposes, it is not uncomfortable to work with the level at 5 foot-candles, and a regulating system that would operate within this limit would be entirely satisfactory. It would be impracticable to attempt to apply mass regulation to the illumination system of a building, as our needs are more specifically unit control in the individual office and subject to adjustment by the tenant. A striking illustration of our annoying problem is demonstrated in Fig. 2, showing the light conditions on the working plane of a desk. A movie reel of the tenant would more clearly demonstrate the calisthenics necessary to maintain workable conditions by adjusting window shadows and operating the light switch, but, nevertheless, the facts are interesting.

It has been asserted that the factors which make for national prosperity and well-being are, in the main, psychological. Although admitting this fact, we trust that the progress to be made in the control of illumination will be productive of some automatic device that will contribute to our well-being, and not continue to disturb our mental state as at present.

The illuminating of building façades has probably run the course of most novel attractions of this type, and mobile color as a means of attracting attention to our buildings has lost much of its value through duplication of effects. We now await new developments in the lighting art which will lend prominence to our buildings, improve the character of the interiors and decrease the burden and complexity of our operating problems.

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Testing Transformer Loads on Primary Side

By J. B. COLTHARP and R. O. HOPKINS
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The Gulf States Utilities Company at Beaumont, Tex., has just completed 305 load tests on small 115-230-2,300-volt distribution transformers using Lincoln, type AD, thermal demand meters on the primary side.

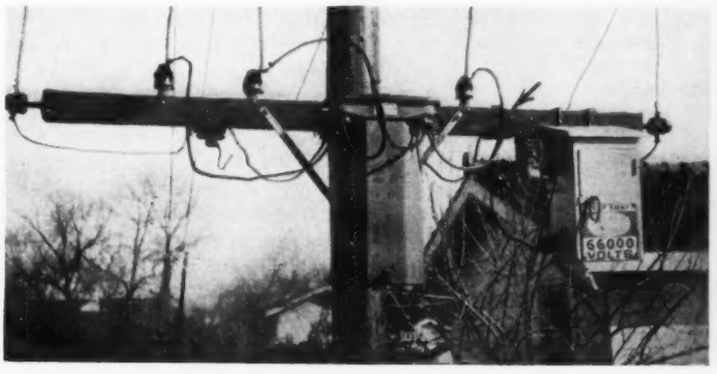
The demand meter is mounted on a slate panel in a weatherproof box and the two No. 6 stranded 5,000-volt weatherproof meter leads are brought out through a common side type outlet bushing. One lead goes through a regular porcelain plug cut-out mounted on the side of the box. Small hot-wire clamps are used at the ends of the leads. Three sizes of meters are used, 5, 10, and 15 amp., covering all sizes of transformers from 5 kva. up to and including 25 kva.

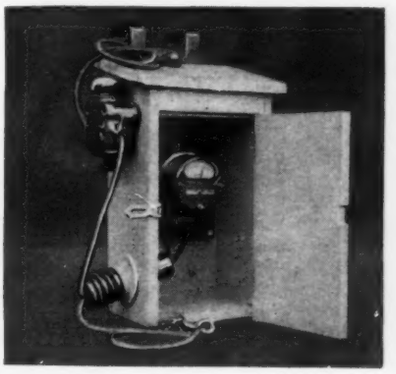
When installing the meter for a test one leg of the primary is bared on each side of one of the transformer cut-outs, the hot-wire clamps hooked on and the transformer cut-out plug pulled. A 24-hour test on each transformer is made.

As full-load primary current on a 5-kva., 2,300-volt transformer is only 2.2 amp., the squared scale of these meters in this case cannot be read accurately where less than full load existed. However, since these tests are made to guard against dangerous overloads, the smaller

Demand testing outfit by-passing primary cut-out and features of set

Arrow points to transformer primary cut-out, on each side of which test set is connected before plug is pulled. Cut-out one side of set affords transformer protection during test.





readings are not of as much importance as the larger readings.

All material other than the meters themselves is regular equipment. The clamps used are regular hot-wire clamps; the fuses are porcelain plug cut-outs used on small transformers; the boxes with their hangers are those used for housing small temporary pole meters; the outlet bushings are used on outdoor primary meter boxes. The complete assembly weighs approximately 50 lb., and is easily handled by one man, so that the cost of the tests is much smaller than with previous methods.

▼

Limitations on Electric Steam Generation

With generating stations, transmission lines, substations and distribution system greatly underloaded by reduced business activity, every utility is interested in finding some outlet for power that will bring some return on the idle investment. Some people have expressed the opinion that industrials with underloaded boilers operating at reduced efficiency and high attendance cost might be interested in electric steam generators if they were served at increment power costs plus a small profit.

Here is what one commercial executive of a large utility company has to say on the subject:

In general, in the United States the application of electricity to the production of steam or of heat in considerable quantities can compete with the use of cheap fuels only in case of the availability of excess capacity and water in existing hydro-electric plants and of excess capacity in transmission lines, substations and distribution lines. That is, the consumption of electrical energy in what might be termed low-grade uses is economic only when it may be delivered at extremely low fixed and operating cost, permitting sale at low rates; such selling prices may then be much under the standard power rates, which latter must cover full charges against investment and production. It follows that when the conditions of available waste power and of reserve capacity in power systems no longer exist, this "low-grade" use of electricity must also cease.

With this in view, any contracts for such use must be for limited periods or subject to cancellation when the conditions upon which they were predicated cease to exist. It will, of course, be the aim of power companies to promote only those installations that will permit writing off the cost of the electric boiler or similar installation within the period during which excess power system capacity will be available. While therefore, under certain conditions, electrical energy can economically be used for the generation of steam or production of heat on a large scale it must usually be considered as a relatively temporary use, subject to reduction or elimination as soon as the period of excess capacity has passed.

With these limitations in mind, the sale of electricity for the production of steam or heat in considerable quantities may, under existing conditions and in some parts of the country, be economic for consumer and power company. The customer obtains a most convenient service at a low cost, competing with other methods of supply and the utility gets some added revenue. It is fair, however, to neither party that this use should be promoted without full understanding of the necessary limiting conditions.

Such special use of electrical energy should be differentiated from the consumption for many kinds of small or moderate-sized space or industrial heating load, in which the convenience, ease of control, simplicity and safety of operation and character of result or product much more than compensate for an energy cost somewhat higher than that resulting from fuel burning. These advantages of the use of electricity, for a multitude of domestic, commercial and industrial heating operations, are such as to present a very wide field, profitable alike to the user and the producer of electrical energy. For these uses standard electric rates are suitable.

READERS' FORUM

Why San Francisco Barred Material for Home-Owner Wiring

To the Editor of the ELECTRICAL WORLD:

My attention has been called to an item appearing in the March 18 issue of the ELECTRICAL WORLD (page 339) with the caption "San Francisco Inspector Hits Home-Owner Wiring."

Approval of the sale and use of "Electrotrim" in San Francisco was given to a representative of the Electrotrim Company with the understanding that the material be sold to electrical jobbers and registered electrical contractors, but not to hardware and other merchandising stores. This agreement was not lived up to and it was recently found that it was being sold by hardware stores throughout the city.

As you are undoubtedly aware, San Francisco has had in effect for something over a year Electrical Retail Sales Ordinance No. 9120. The first electrical material that was ordered off sale were the so-called lamp cord baseboard receptacles, with the result that for the past year the practice of stapling lamp cord on baseboards and installing a multiplicity of plug receptacles by the handy man has been definitely stopped inasmuch it has been impossible to purchase these receptacles in San Francisco.

When "Electrotrim" and its accompanying devices were placed on sale in the hardware stores the janitor and handy man started a run on the hardware stores which made the recent run on banks pale into insignificance in comparison, but, upon investigation, we found that, due to the high price of the trim, they were buying the receptacles but not the trim, and purchasing lamp cord, thus creating the same old condition, with the exception that on the end of the cord they were connecting a receptacle which was approved by the Underwriters for use only with "Electrotrim" and not with cord. This, you will readily see, created a condition which was not consistent and not only defeated the purpose of the ordinance but defeated the very purpose of bringing out this commodity. However, the electrical contractors in San Francisco, who do a considerable amount of this class of work, proved to this department that, if the restriction of a maximum of 20 ft., as permitted by the Code, were adhered to, the material would be used only in a small percentage of cases, but would encourage the handy man, as the hardware dealer was displaying the material as approved material.

I feel, however, that there is a place in certain installations for this material and would gladly approve its use provided it was installed by registered electrical contractors.

I hope that I have made myself clear and that you will see that this was not an arbitrary action on my part, but taken only to be consistent and only after giving the matter careful consideration.

RALPH W. WILEY,
Chief Department of Electricity.
City and County of San Francisco, Calif.

Men of the Industry

Dr. C. H. Sharp Retires From Testing Laboratories

Dr. Clayton H. Sharp, vice-president and technical adviser of Electrical Testing Laboratories, has retired from the company's service and will engage in consulting engineering. Dr. Sharp entered the employ of the laboratories in 1901 as test officer at a time when the company's activities were confined to testing incandescent electric lamps. He has been actively identified with the company continuously since that time,

for the larger part of it as technical director. During that period he has devoted special attention to various technical matters connected with instruments and method of measurement in electricity and light. Recently he has devoted much attention to photoelectric methods as applied to photometry and spectrophotometry. Years ago he, with Preston S. Millar, developed the Sharp-Millar photometer, which was the pioneer portable photometer in this country. Later he designed the well-known foot-candle meter.

As president of the U. S. National Committee, International Electrotechnical Commission, since 1924 Dr. Sharp has been active in the work of this commission and has established wide contacts abroad. Among his important activities may be mentioned his work as chairman and member of the Illuminating Engineering Society's committee on nomenclature and standards which established the definition and units of photometry, as chairman of the I.E.S. committee on headlamps and also his work on the meter code and in the development of a satisfactory method of testing current transformers.

Dr. Sharp is a fellow of the American Institute of Electrical Engineers, the American Association for the Advancement of Science and the American Physical Society, past-president of the Illuminating Engineering Society, vice-president of the International Commission on Illumination and a member of the Société Française des Electriciens, Associazione Elettrotechnica Italiana and Verband Deutscher Elektrotechniker and of other organizations.

▼

C. D. Porter to Assume New Duties in Indiana

Chester D. Porter, vice-president and general manager of the Omaha & Council Bluffs Street Railway Company, Omaha, Neb., has been elected vice-president and general manager of three Indiana units in what was the Insull system—Northern Indiana Power Company, Central Indiana Power Company and Public Service Company of Indiana. Mr. Porter will assume his new duties June 1. In transferring his interests from Nebraska to Indiana Mr. Porter will again become associated with J. N. Shannahan, formerly president of the Omaha & Council Bluffs Street Railway, now president of the Midland United Company and chief executive officer of its subsidiary companies with headquarters in Indianapolis. Mr. Porter was also vice-president and general manager of the Virginia Public Service Company, Newport News, when Mr. Shannahan was head of that utility. He has been elected a member of the board of directors of the three Indiana companies as well as to the office of vice-president and general manager.

▼

EDWIN J. BOOTH, who has been assistant to the president of the Central Indiana Power Company, has just been elected a vice-president of that company.

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LUTHER R. NASH has been appointed head of valuation and appraisal work for properties managed by and clients of the Stone & Webster Engineering Corporation with headquarters in New York. All rate research activities of Stone & Webster will also be under his direction. Mr. Nash has been in the Stone & Webster organization for many years and his career embraces wide experience in the engineering field, operation of properties, rate problems, valuations, commission and court work. He was recently made a vice-president of the Stone & Webster Engineering Corporation, taking over the duties of the late W. H. Blood, Jr., in addition to his regular activities. He has lectured extensively at Harvard University and the Massachusetts Institute of Technology, and is the author of numerous important publications in the field of utility economics.

▼

L. B. Herrington Resigns

Lewis B. Herrington, president of the Kentucky Utilities Company since 1927, has resigned from that position and Robert M. Watt, executive vice-president, will assume the duties of president until the directors name a successor. Mr. Herrington joined Kentucky Utilities when it was formed in 1912 and prior to that time had operated power plants in central Kentucky, at Richmond and elsewhere. He is the man who conceived the possibilities of Dix River and who was responsible for the erection of the well-known Dix River hydro-

electric plant. It was in 1917 that he was named vice-president and general manager, becoming president ten years later, when he succeeded Harry Reid. In addition to being head of the Kentucky Utilities Company he was also president of several of its subsidiaries, including Old Dominion Power Company, Lexington Utilities Company, Kentucky Power & Light Company, Consolidated Coach Corporation and their various subsidiaries. He served as president of the old Kentucky Association of Public Utilities and of the Kentucky Ice Manufacturers Association. Mr. Herrington has not announced his future plans.

Mr. Watt has also been connected with the company since its formation. For several years he was in charge of its power operations in southeastern Kentucky with headquarters at Pineville and two years ago, when he was elected executive vice-president, he moved his offices to the company general office at Louisville.

▼

NORMAN T. WILCOX, who was with Stone & Webster for 28 years in various operating and commercial positions, past-chairman of the Commercial National Section of the National Electric Light Association and prominently

identified with sales policies and movements in central-station circles for many years, has established practice as a consultant in electrical sales development with headquarters at Melvin Village, N. H. Mr. Wilcox will engage in market surveys and analyses for utilities and manufacturers, rendering advisory services in connection with profitable sales and load-building, rate problems and customer relations.

▼

OBITUARY

WILLIAM E. IRISH, electrical engineer and inventor, died in Cleveland, Ohio, April 25 in his ninety-first year. Mr. Irish, who was born in England, was credited with having done considerable experimental work in both the field of telegraphy and telephony. He was the inventor of a switchboard system, a self-regulating arc lamp and of other devices.

•

JAMES B. OLSON, a prominent figure in the electrical wire and cable industry for many years, died April 30 at his home in Stewart Manor, Long Island. At the time of his death Mr. Olson was identified with the sales staff of E. B. Latham & Company, electrical wholesalers, New York. He had been connected with the Habirshaw Electric Cable Company and predecessor companies for more than twenty years, when he resigned in 1918 as general sales manager and assistant secretary. Subsequently he joined the sales staff of the Okonite Wire Company. Mr. Olson was 69 years of age.

•

WILLIAM H. RICHARDSON, electrical engineer, died in Cincinnati April 26 at the age of 84. A native of Brooklyn, N. Y., Mr. Richardson received his education at New York University and in Sheffield, England. After devoting several years to manufacturing he entered the engineering field and became superintendent of construction of electric plants at Glenwood Springs, Colo., and Cheyenne, Wyo.

•

L. PHILIP COLLETTE, superintendent of the Wyman hydro-electric plant of the Central Maine Power Company, near Bingham, Me., lost his life by drowning when a canoe from which he was fishing was overturned May 1. Mr. Collette was educated at McGill University, Montreal, and after being employed by the Central Massachusetts Electric Company, Palmer, Mass., joined the Central Maine organization as an electrical engineer. He was in charge of the building of the Maxey's substation and directed all electrical field work in the construction of the Wyman development. He was about 40 years of age.

WILLIAM T. GOULD, electrical superintendent of the Edgar generating station of the Edison Electric Illuminating Company of Boston, died at his home in Wollaston, Mass., April 24, after a brief illness. He was born at Waterbury, Vt., in 1881 and had been in the electrical division of the company's generating department since 1904. He was a past-president of the New England System Operators Club and was widely known in operating engineering circles among the interconnected systems of the East.

▼

New Equipment Available

Service Entrance Cables and Service Drop Cables

Service entrance cables and service drop cables have been announced by the American Steel & Wire Company, Chicago. The entrance cable is a high-grade cable carrying Underwriters' approval for service from weatherhead to meter and from meter to range. This cable is especially designed for low cost, ease of installation, long life and maximum safety. It provides its own conduit, consisting of heavy galvanized steel tape armor covered with a flame-resisting weatherproof braid.

The drop cable is for service from pole to weatherhead and is insulated with "Amerite," a long-life rubber compound. It is protected with non-migrating and alkali-resisting tape and weatherproof braid saturated with a compound. Twisted conductors prevent festooning with disintegrating braid.

▼

Relays for Automatically Applying Field Excitation

Relays for automatically applying and removing field excitation and for protecting the stator and amortisseur windings under all operating conditions have been announced by the General Electric Company. For automatically applying field excitation when the motor reaches a predetermined speed near synchronism a new relay, known as the slip-frequency field-application relay, is provided. The coil of this relay is connected across a section of the field discharge with a half-wave copper oxide rectifier in series with it. During the starting period induced field current of slip-frequency flows through the discharge resistor so that half-waves of slip-frequency current flow through the relay to pick up and open its normally closed contacts.

▼

RUBBER-COVERED HEATER CORD for all types of heater appliances has been announced by the Belden Manufacturing Company, Chicago. The new cord has many features that recommend its use. It is extra flexible and does not kink, has no braid to fray or break and is easily cleaned when soiled, it is claimed. Individual wires carry the usual asbestos insulation under the over-all rubber wall. It is furnished regularly with size No. 16 wire for 1,000-watt requirements.

▼

Photolux Control of Lighting

A device that operates to turn electric lights on or off when daylight decreases or increases in intensity to a predetermined value has been developed by the Westinghouse Electric & Manufacturing Company. The applications for this unit, called "Photolux," are many and vary from insuring adequate office and factory lighting to lending a maximum of advertising value to illuminated signs and show windows.

Some of the places where the "Photolux" is applied to turn artificial light on and off without any supervision are offices, industrial plants, show windows, schools, etc. The indoor models of "Photolux" are housed in panelboard cabinets for either flush or projection mounting equipped with locks. Adequate knockouts are provided on all sides of the case and there is ample room for wiring inside the cabinet.

▼

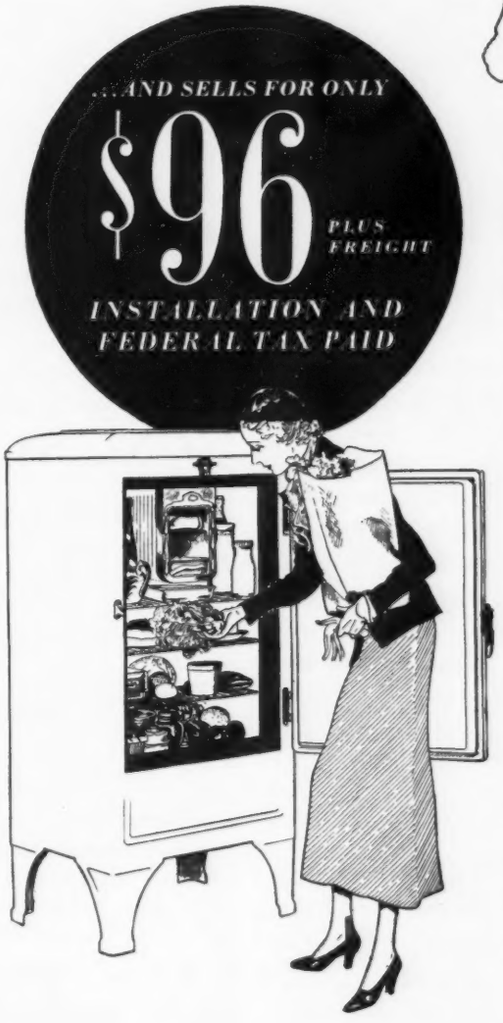
HIGH-POWER-FACTOR SIGN TRANSFORMERS, like the standard line used for luminous tubes, except that there is a capacitor which corrects the power factor of the sign, when normal tube footage is applied, to a value high enough to be generally acceptable to lighting companies, are announced by the Jefferson Electric Company, Bellwood, Ill. Types are made for secondary voltages of 5,000, 7,500, 9,000, 12,000 and 15,000.

•

A UTILITY TOOL with a compactness and portability hitherto unknown in a continuous-heated soldering iron, blowtorch and solder cup heater is announced by the Everhot Manufacturing Company, Maywood, Ill. The flame plays continuously on the soldering iron or soldering cup, keeping it at an unvarying temperature as long as may be desired. The correct degree of heat is easily obtainable by regulating the flame.

More prospects *...more* sales

WITH THIS GENUINE FRIGIDAIRE THAT USES NO MORE CURRENT THAN ONE ORDINARY LAMP BULB



Here's an entirely *new* Frigidaire; one that operates with amazing economy, using no more current than one ordinary lamp bulb. Has automatic defrosting, automatic releasing of ice trays, cold storage compartment, unusual beauty, with genuine Frigidaire quality throughout . . . a new Frigidaire that greatly enlarges the possibilities for Frigidaire sales in your territory.

New DeLuxe All-Porcelain Models

Added to this new Frigidaire product, are the new Super Series All-Porcelain Frigidaires. They are entirely new and different—the finest Frigidaires ever built, with every worth-while improvement found on any refrigerator . . . and many new and exclusive ones besides. Greater food space, interior light, adjustable shelves, double Hydrator capacity, cold storage compartment, far greater ice capacity, *new low prices* . . . these are just some of the features which make these deluxe models so appealing to customers.

Special Sales Service for Utilities

But Frigidaire doesn't stop with offering greater values. Through our intensive cooperation with Utilities we know what your problems are. We know what kind of plans succeed and which do not. And from this experience we've developed plans that *really sell* . . . tried and tested plans that have proved their *power to produce*. And we're ready to cooperate with you in adapting these plans to *your individual needs*.

Included in this service is a plan for selling Frigidaire Air Conditioning Equipment on the same basis as electric appliances. Here's a *new* opportunity for Utilities . . . one which opens new markets and new sources of profit.

Let Us Work With You

Full details of Frigidaire's new products for 1933 are now ready. Also facts about the individualized sales service for Utility Companies. Both point the way to greater sales and profits this season. One of our representatives, *especially trained in utility merchandising*, will be glad to call. Write us. Frigidaire Corporation, Subsidiary of General Motors Corporation, Dayton, Ohio.

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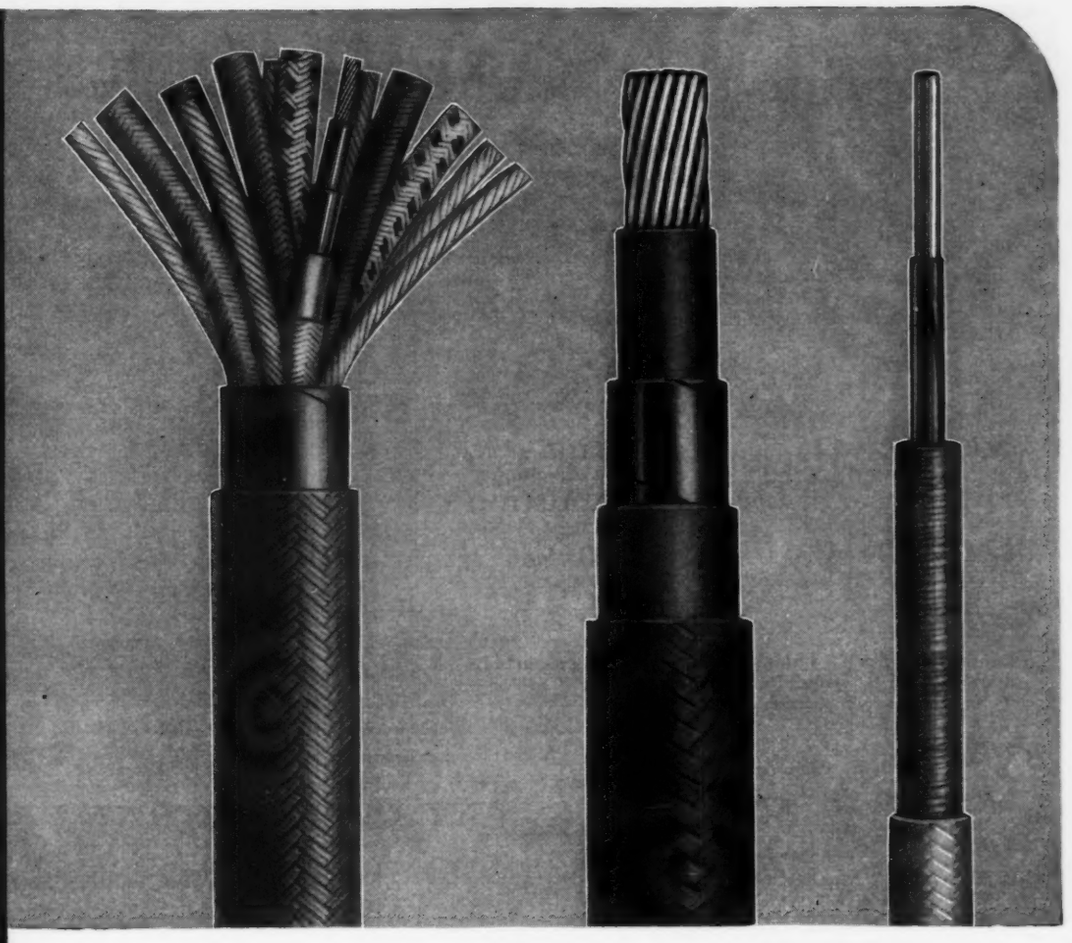

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(Yarn of the Mary Gloster)

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Counter-weighted, dynamically balanced, crankshafts, shimless main bearings, dual overhead valves. Catalog on request. Read what these features mean.

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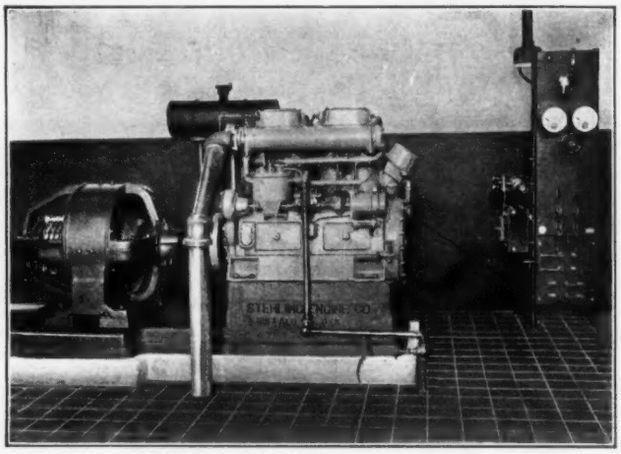

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1—500-kw., 250 V., Westinghouse Synchronous Motor Generator Set.
2—300-kw., 250-V., 1200-r.p.m., 4100-V., G. E. Synchronous Motors.
1—250-kw., 230-V., 3-ph., 60-cy., 2300-4600-V. Synchronous Motor Generator Set.
1—200-kw., 230 V., 3 ph., 60-cy., 2300-4100-V. Synchronous Motor Generator Set.
1—200-kw., 125-V., 3-wire, 3-unit Ridgway.

ENGINE GENERATOR SETS

3—200 Kva, 220/440/600/2300-V., General Electric Ames Uniflow.

TURBINES

1—475-kva. Westinghouse Non-condensing.

TRANSFORMERS

4—333-kva. Pittsburgh, 4100/110/220-V.
3—200-kva. G.E., 2400/120/240-V.
4—150-kva. Westinghouse, 2400/120/240-V.
3—100-kva. Westinghouse, 2400/120/240-V.

A. C. GENERATORS

No.	Kw.	R.p.m.	Volts	Ph.	Type
1	400	900	2300-4000	3	Westg.
1	350	600	440	3	Westg.
2	125	900	2300	3	Cr.-Wh.
2	100	900	230-2300	3	G.E.

MOTORS—3-Phase, 60-Cycle

No.	Hp.	R.p.m.	Volts	Type
1	800	180	4000	Westghse. Syn.
1	600 kva.	900	440	G.E. Syn. Cond..
1	500	150	2300	Elec. Meh. Syn.
1	500	900	440/4000	Westghse. Syn.
1	500	900	440-2200	G.E. Syn.
1	350	900	2200/4000	Wh. Syn.
2	300	600	445-2300	G.E. Syn.
1	250	600	2200/4000	G.E. Syn.
1	250	600	220-440	Westghse. Syn

SLIP RING MOTORS, 3-PH., 60-CY.

Hp.	Volts	Make	Speed
700	2300	G.E.	900
220	220–440	G.E.	450
200	440–220	G.E.	600
150	2200–440–220	G.E.	514
150	2200–220–440	G.E.	720
150	220–440–550	G.E.	600
125	220–440	G.E.	1800
100	550	Westghse.	900
100	2200	Westghse.	900
100	440–220	G.E.	720
100	550	G.E.	900
50	2200	G.E.	514

SYNCHRONOUS MOTORS, 3-PH., 60-CY.

300	220–440	G.E.	600
240	2200–440–220	G.E.	600
225	440–220	G.E.	600
172	2200–440–220	G.E.	600
160	2200–440–220	G.E.	720
144	2200–550	G.E.	900
120	2200–550	G.E.	900

MOTOR GENERATOR SETS

1—500-kw., 250-275-V., 720-r.p.m., G.E. connected to AT12300-4100-V., synchronous motor
1—150-kw., 250-275-V., 1200-r.p.m., G.E. connected to 225-kva., 2300-4000-V., 3-ph., 60-cy. synchronous motor.
1—145-kw., 125-V., 900-r.p.m. Westghss., connected to 285-hp., 2400-4100-V., 3-ph., 60 cy. synchronous motor.
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TREASURY DEPARTMENT, Office of the Supervising Architect, Washington, D. C., April 27, 1933.—Sealed bids in duplicate subject to the conditions contained herein will be publicly opened in this office at 3 p.m., May 12, 1933, for furnishing all labor and materials and performing all work for the special interior lighting fixtures in the U. S. post office, court house, etc., Sioux City, Iowa. The prevailing rate of wage shall be paid all laborers and mechanics employed on the project as provided in the Act of March 3, 1931 (Public No. 798). In awarding the contract, consideration will be given only to manufacturers of lighting fixtures who have previously furnished and installed work comparable in all respects with that for which the bid is submitted, and who can, if so requested, show evidence that they have performed such work in a satisfactory manner. Drawing and specifications, not exceeding one set, may be obtained by any satisfactory general contractor at this office in the discretion of the supervising architect. JAS. A. WETMORE, Acting Supervising Architect. (181)

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TREASURY DEPARTMENT, Office of the Supervising Architect, Washington, D. C., April 25, 1933.—Sealed bids in duplicate subject to the conditions contained herein, will be publicly opened in this office at 3 p.m., May 12, 1933, for furnishing all labor and materials and performing all work for the special exterior and interior lighting fixtures at the U. S. post office and court house, Davenport, Iowa. The prevailing rate of wage shall be paid all laborers and mechanics employed on the project as provided in the Act of March 3, 1931 (Public No. 798). In awarding the contract, consideration will be given only to manufacturers of lighting fixtures who have previously furnished and installed work comparable in all respects with that for which the bid is submitted, and who can, if so requested, show evidence that they have performed such work in a satisfactory manner. Drawing and specifications, not exceeding one set, may be obtained by any satisfactory general contractor at this office in the discretion of the supervising architect. JAS. A. WETMORE, Acting Supervising Architect. (182)

TREASURY DEPARTMENT, Office of the Supervising Architect, Washington, D. C., April 27, 1933.—Sealed bids in duplicate subject to the conditions contained herein, will be publicly opened in this office at 3 p.m., May 12, 1933, for furnishing all labor and materials and performing all work for special lighting fixtures for the U. S. post office, Oak Park, Ill. The prevailing rate of wage shall be paid all laborers and mechanics employed on the project as provided in the Act of March 3, 1931 (Public No. 798). In awarding the contract, consideration will be given only to manufacturers of lighting fixtures who have previously furnished and installed work comparable in all respects with that for which the bid is submitted, and who can, if so requested, show evidence that they have performed such work in a satisfactory manner. Drawings and specifications, not exceeding one set, may be obtained by any satisfactory general contractor at this office in the discretion of the supervising architect. JAS. A. WETMORE, Acting Supervising Architect. (183)

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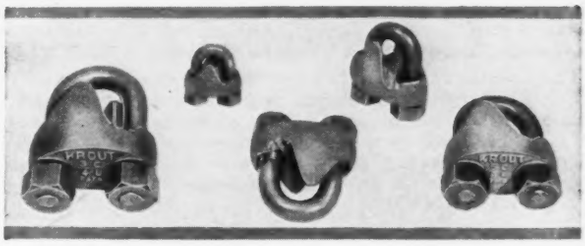

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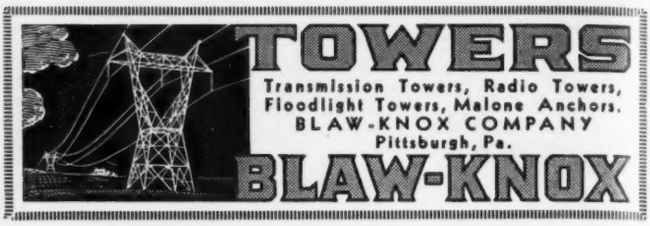

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